THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXII. No. 1593.] LONDON, NOVEMBER 21, 1893. [45TH YEAR. PRICE 6d.

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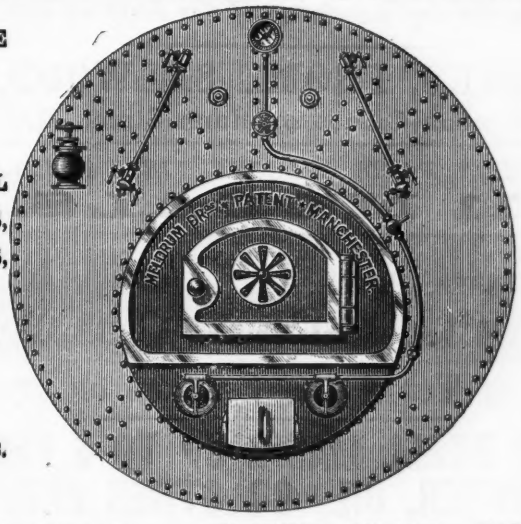

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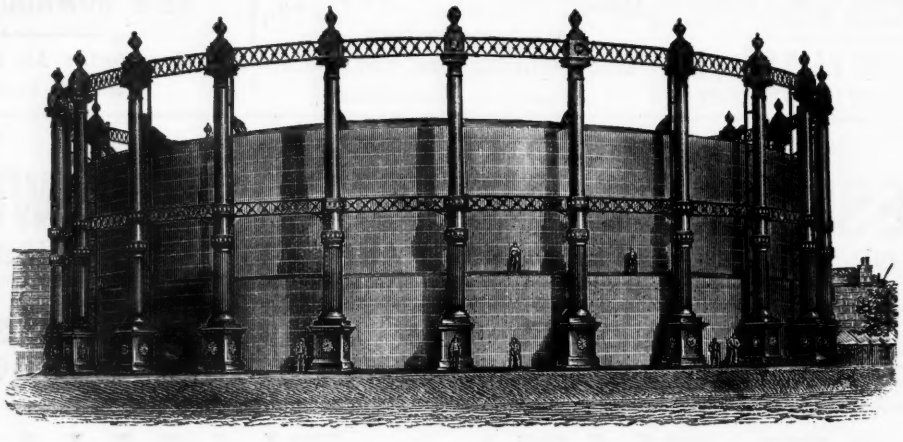

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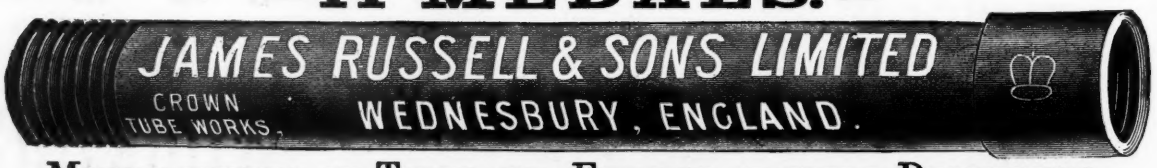

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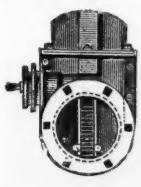

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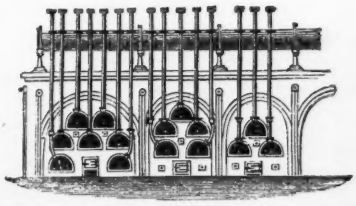

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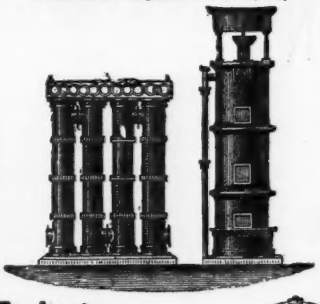

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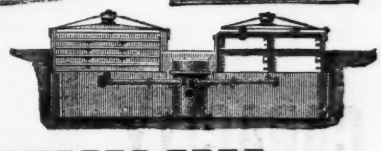

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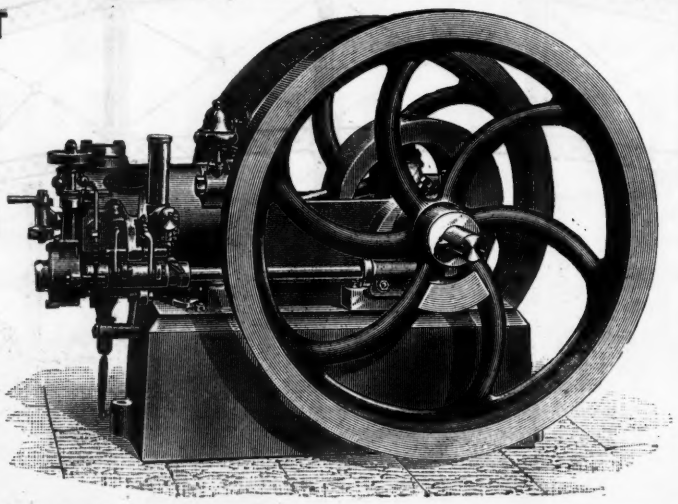

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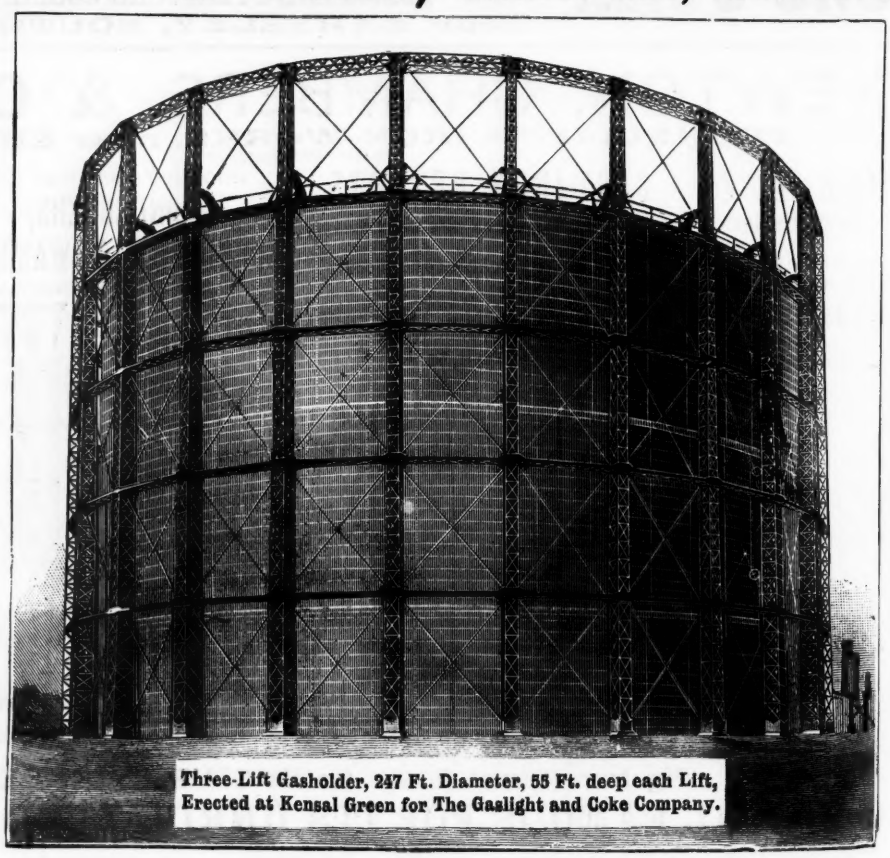

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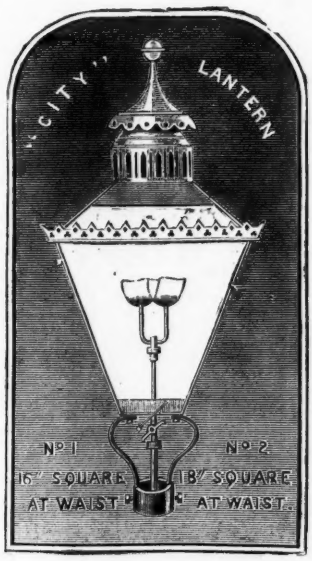

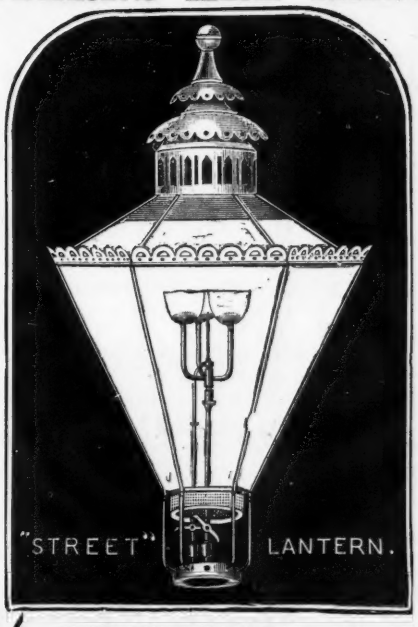

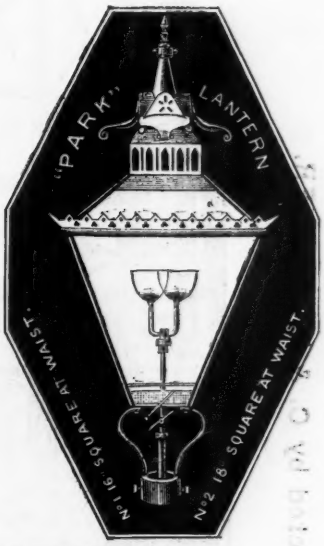

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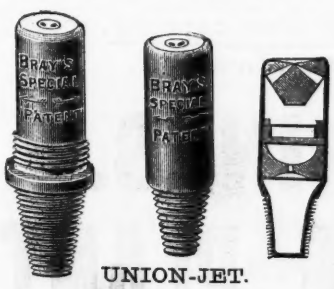

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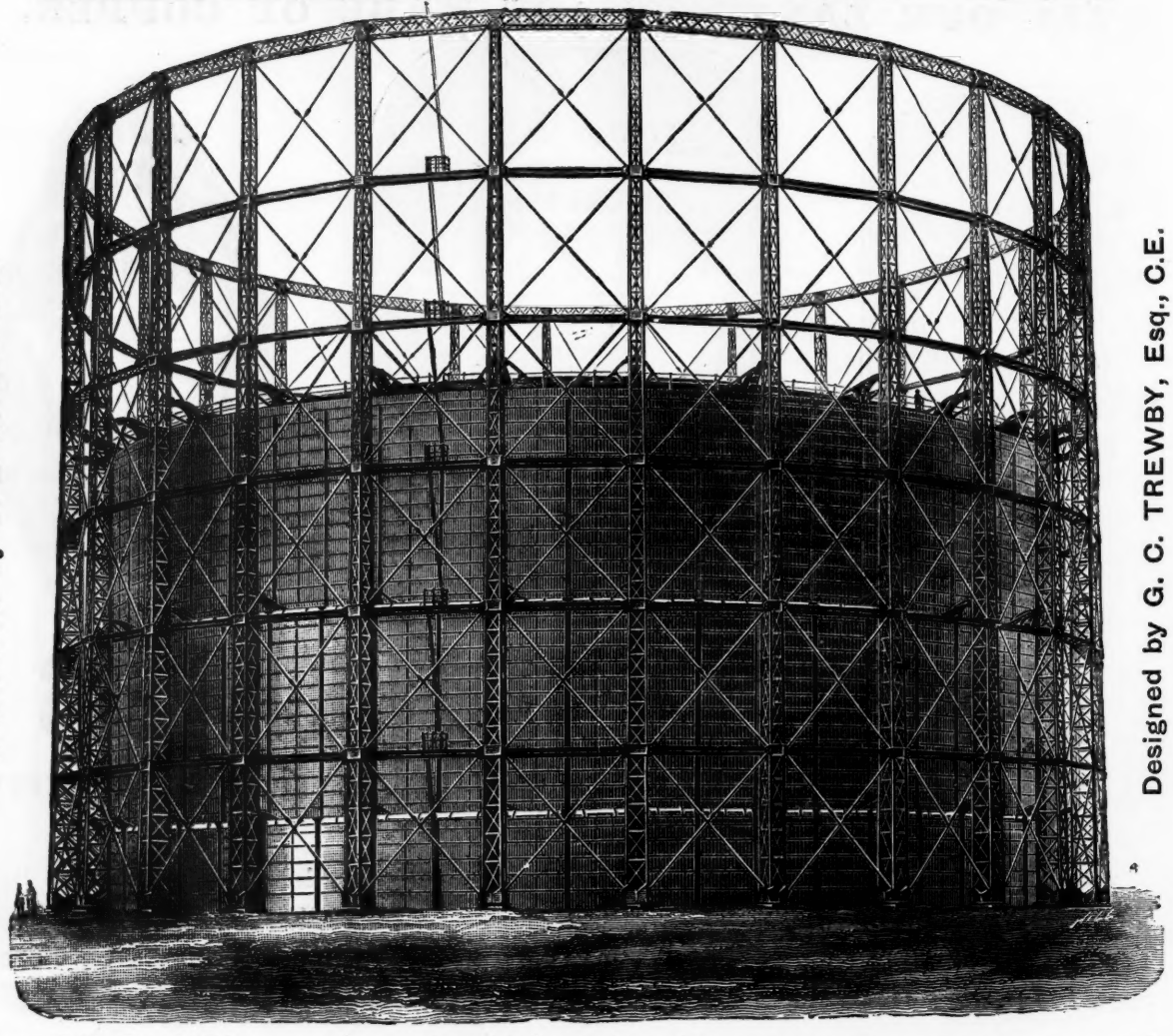

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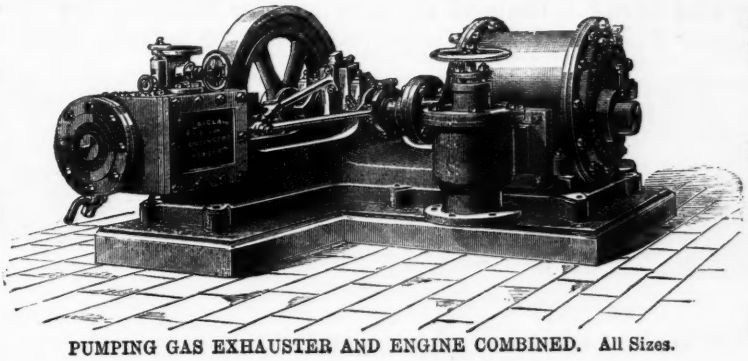

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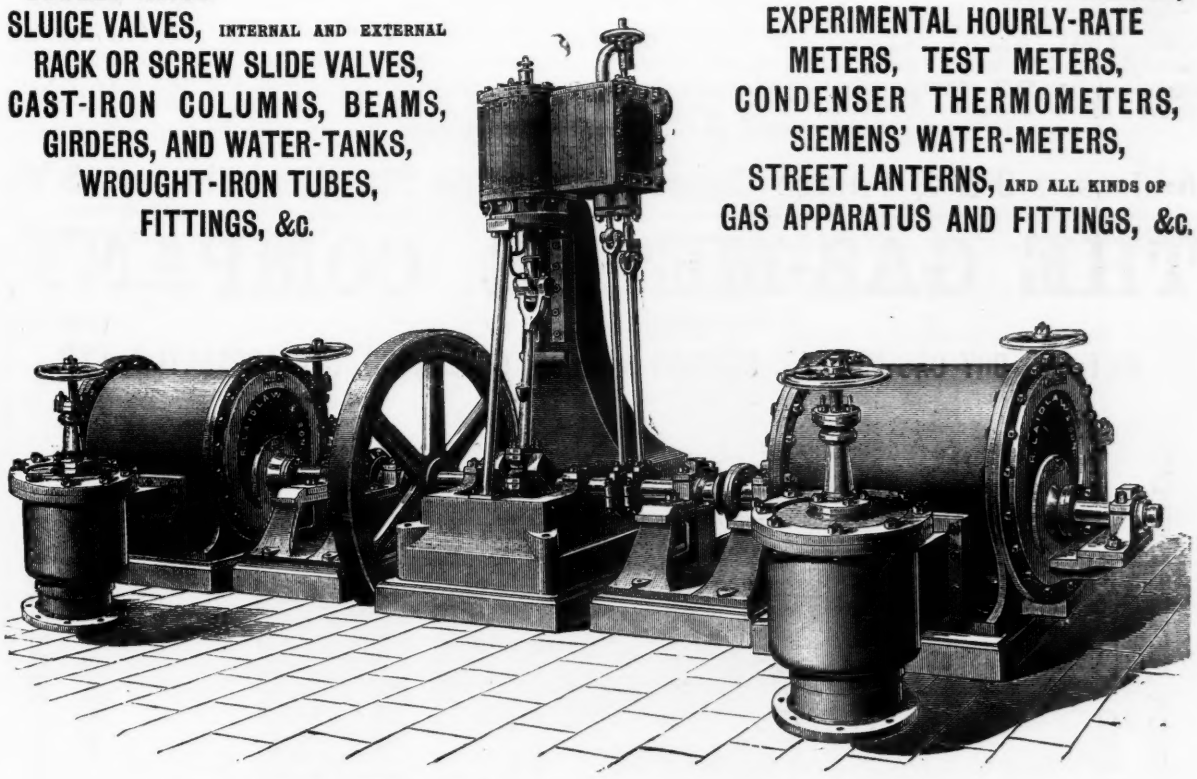

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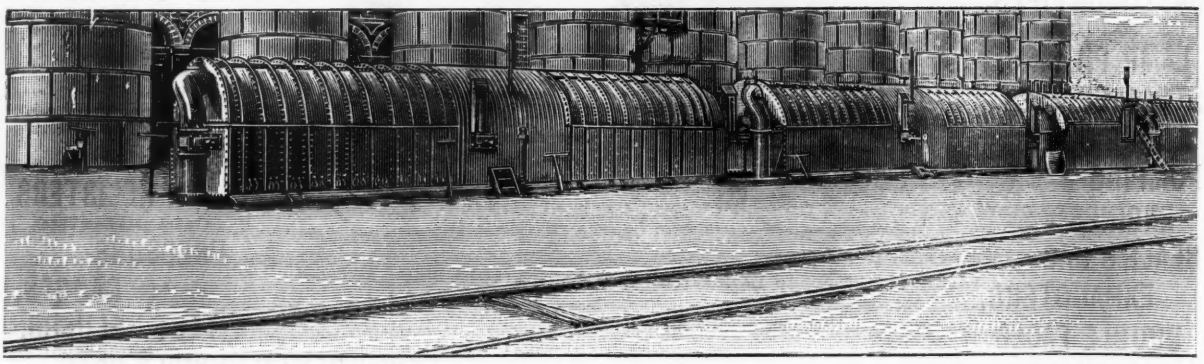

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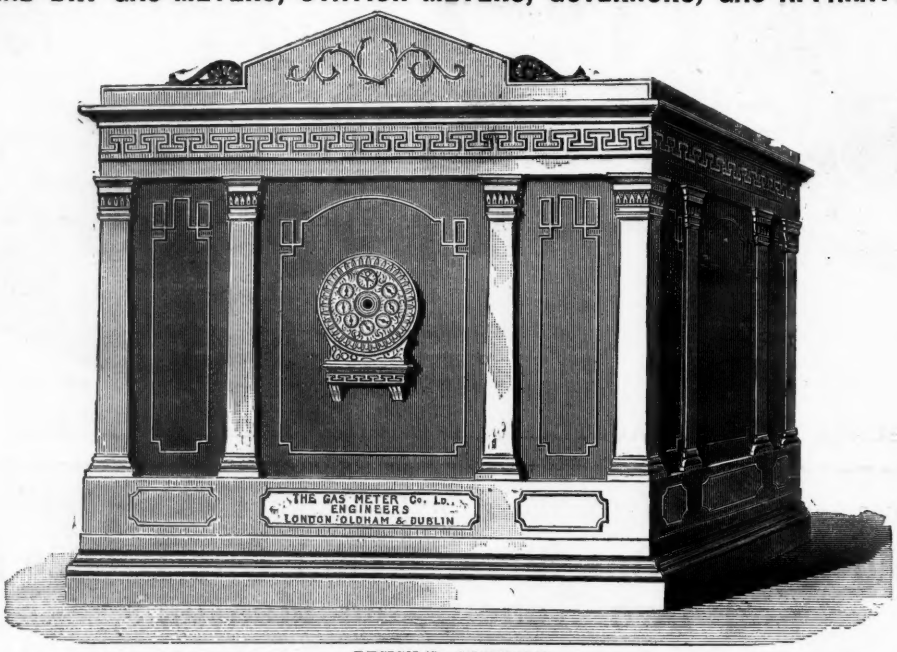

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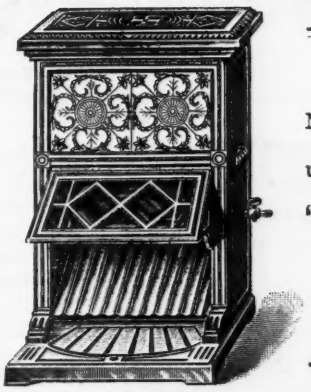

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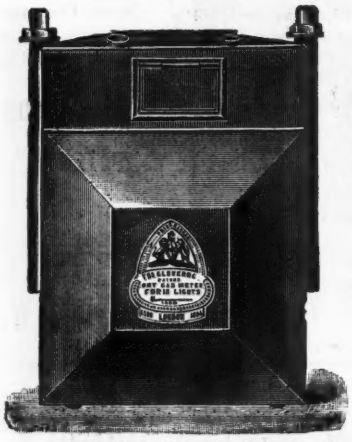

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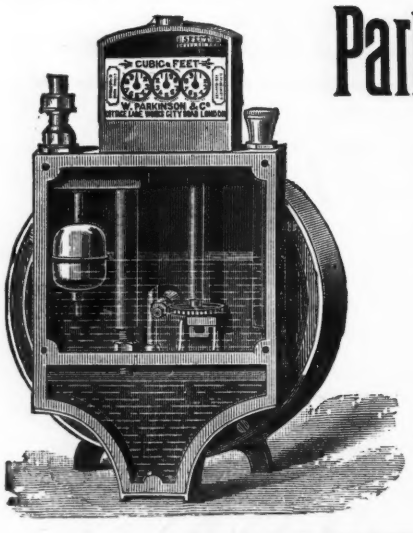

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TO CORRESPONDENTS.

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THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, NOVEMBER 21, 1893.

The Last of the Coal War.

IT is with the utmost satisfaction that we address our readers for the last time as a topic of current interest upon the subject of the coal war, happily brought to an end last week through the intervention of the Earl of Rosebery, who has earned, in the voluntarily assumed capacity of mediator between colliery proprietors and miners, a personal triumph as great as that of any diplomatist who ever persuaded belligerent nations to lay down their arms. When we last wrote on this topic, it was to signalize the mournful fact that the end of the trouble seemed to be as far off as ever; for there was nothing in prospect but a continuance of the struggle until ruin or starvation should render one or the other side unable to persevere in their conflict. Once more, however, it has been shown that "when night is darkest, dawn is nearest." The week ending on the 11th inst. was the gloomiest for the coal trade of the Federation districts, and for all the industries depending upon it, that this century has known. And yet there was a glimmering of light in the darkness, for those watchers who did not turn their backs to the only quarter whence such a ray of comfort might be looked for, in the confessed narrowness of the material difference that separated the parties to the last conference of masters and men. There were irreconcileables on both sides, it is true; and in times of open conflict it is the most desperate fighters that come to the front. There was also, as we remarked, an element of irrationality in the demands of the spokesmen for the Miners' Federation, which rendered a direct solution of the difficulty impossible so long as it was retained. It was observed by wordly-wise bystanders that if the Chairman at the last Westminster Hotel conference had not been a partisan, the result of this meeting might, and probably would, have been quite different. It is no reflection upon Mr. A. M. Chambers to remark that his interest in the result rendered him incapable of exerting all the influence of a mediator. Up to the end of the week, however, an ideal mediator was still to seek.

On Monday, the 13th, the Prime Minister took a decided step at what must be regarded as the "psycho-" logical moment" of the weary controversy. He proposed to both parties a conference, to be held under the Earl of Rosebery as Chairman; and, with a degree of alacrity that testified to the existence of a sense of exhaustion, the parties accepted the invitation. Lord Rosebery was prompt and decided in his preliminary action, as he was afterwards to prove himself wise and strong in ruling counsel. The important meeting took place on Friday, lasted throughout the day, and resulted in the settlement the terms of which will be found detailed elsewhere, and which are by this time familiar to every interested person throughout the kingdom. As might have been expected, the arrangement come to is essentially a compromise, in which both sides gain something, and yield something else. Care was taken by the astute Chairman to remove a prominent obstacle to agreement between the parties—the presence of newspaper reporters, before whom various members of the conference would have been certain to indulge in the vain triumph of "making points." He also endeavoured to render the resumption of amicable relations between employers and employed easy by requiring from all the delegates a promise to abstain from boasting and "telling tales out "of school," before letting them go among the raging reporters who were lying in wait for them outside the Foreign Office, any one of whom would sacrifice the interests of the coal or any other trade in order to get a telling personal "item." This policy of Lord Rosebery's was a snub to the "popular press" which newspaper men in general might well take in good part and profit by, but which they will probably ignore. The newspapers that have sided with the men came out next day with claims for a "glorious victory," because the pits are to be opened and worked until February at the old rates of wages. This is a point gained by the men; but, on the other hand, the price of coal has been forced up for the rest of the winter to a figure that will easily bear this charge. On the other hand, the employers gain their point of an Arbitration Board to fix the rate of wages for the future; and this authority is to be absolutely unfettered by any instruction as to the "minimum living wage" for which the Federation leaders have been holding out. The abandonment of this economic fallacy alone rendered compromise possible.

The newspapers have already begun to ask questions as to how the Board of Conciliation is to work; but this curiosity is surely superfluous as yet. The less newspaper discussion there is upon this matter, the fewer misunderstandings will be circulated. What the Board has to aim at is an automatic arrangement similar in action to that which keeps the industrial peace in South Wales. This will not please those men who make a living by fishing in troubled waters, and whose attempt to capture South Wales was repulsed with loss; but the cost and suffering of the disturbance now happily composed have been too great for the nation to allow a restoration of the state of things which rendered such an outbreak possible.

Whether the disturbing elements arose through the action of masters or of men, it has been abundantly manifested that neither party is strong enough to have its own way in the settlement of such disputes; and consequently both must be prevented from originating them. This will henceforth be a national concern. Before concluding this notice of the issue of Lord Rosebery's action, it is only right that we should bear testimony to the splendid service the noble Earl—the phrase is more than a convention in his case—has rendered, not only to the coal trade, but also to the community. The country has a right to expect great things of the men to whom the existing social order has been kindest. Fret and strut as they may, the fussy notorieties of the passing hour, several of whom have vainly tried to tackle the coal difficulty, can only foist themselves into mischievous pre-eminence when the men who are born and bred to high responsibilities shirk their duty. Lord Rosebery is a bright example of what can be done for the public good by those who make of rank, wealth, and culture a starting-point for a career of devotion to the service of their country, instead of regarding these great advantages either as a satisfaction in themselves or as an excuse for leading a life of Olympian remoteness from the common cares of humanity. Lastly, one can but admire the splendid qualities of endurance and courage in defence of what they believed to be their right course of action which were displayed by both sides in this historic struggle, while hoping that no such occasion for manifesting these true British virtues will recur in our own or any later time.

Coal Prices and Fogs.

THE most curious commentary upon the coal famine of London which has come under our notice is supplied by a correspondent of the *Pall Mall Gazette*, writing to this eclectic newspaper with reference to the first fog of the season, which occurred on Tuesday last. It is decidedly late for these visitors of the early winter to put in an appearance; and this one was by no means a full-blooded specimen of the class. The writer refers to the high price of coal the immunity from this "pestilence" which London has enjoyed to the middle of November; and he points to the effect as illustrating "the wonderful change which "would take place in the atmosphere of London were a "heavy penalty in the shape of a duty placed upon coal "consumed in the London district, and the consumption "of gas as fuel encouraged." He goes on to observe that "now the electric light has so far developed that it "can be used, light for light, at about the same price as "gas," if gas were only required for fuel purposes "it "could be delivered by the Gas Companies at less than "1s. per 1000 cubic feet through the meters." It is hardly worth while to point out or comment upon the weakness, both in statement and argument, of these passages. The writer returns to reason, however, with the assertion that, "even at the present price, a well-constructed gas-stove "will deliver heat at about the same cost as an open coal "grate." And then, with a final lapse into nonsense, the writer implores the County Council to take this matter in hand, though what the Council are to do, and how they are to do it, remains in obscurity.

We sympathize with his aspirations after a purer atmosphere for London, to be brought about by more general use of gas-stoves for heating apartments; and we agree that this can be effected in many instances at no additional expense to the householder. Indeed, it is possible to go farther, and to show that unless something of the kind is done, and that shortly, the future state of London in the matter of fogs will be worse than the present. For whatever else the "flat" system, according to which London is being rebuilt, may entail upon the population, it certainly means the replacing of every single chimney by five or six, perhaps by more. It also means obstruction to the passage of air, and obscuration of light, by the great height to which the new buildings are carried. Before many years are over, a great deal of London will consist of a network of narrow streets cutting like ravines through mountainous piles of bricks and mortar, which in the poorer quarters will bear the sarcastic name of "model "dwellings," and in the more fashionable neighbourhoods will be known as "mansions," or "flats." What will the air of London be like then?

There is not nearly so much attention paid to this aspect of Metropolitan life as it deserves. Every new tenement is, of course, fitted with its open fireplace; and the tenant is then left to exercise his own discretion as to what he will do with it. As a matter of individual taste, he may prefer the open coal fire to any possible substitute for it; but he would often try a gas-fire or a warming-stove if his attention were drawn to the many practical advantages of these appliances. In a more advanced stage of civilization, the householder may be able to go to some public authority for information respecting the qualities of the articles, whether gas-stoves or anything else, that are open to his selection. At the present time, of course, he cannot obtain any such information. It would be contrary to the canons of Free Trade to tell a prospective purchaser which article is made to sell and which will serve him best in the long run. Meanwhile, London continues to be smoky and foggy, because vested interests and force of custom decree that so it shall be.

Exit J. H. Wilson.

HAVING failed all along the line in his attempts to get the various legal judgments against himself, the results of his disastrous campaign against newspaper critics, reversed or annulled, the notorious J. H. Wilson, M.P., Secretary of the National Amalgamated Sailors' and Firemen's Union, has had a declaration of bankruptcy filed against him, at the suit of the Union Newspaper Company; and so (save for the improbable event of the members of the Union, in whose name he played so many disastrous tricks, coming forward with enough money to pay 20s. in the pound on his personal liabilities) he quits, it is to be hoped for ever, a stage which he never adorned, and on which he has already lingered far too long. If the *Labour Gazette* were worth anything as a means of instructing working men as to the manner in which they may be deceived by their professing friends, it would reproduce in full *The Times* summary of the last of the Wilson cases to trouble the Court of Appeal. It is a painful commentary upon the practical outcome of the efforts of poor mercantile Jack to protect his own interests by forming a Union. The attempt might have had a very different issue had the management of the Union fallen into other hands. But, from the very beginning of its existence, the Union meant Wilson; and the history of industrial organizations might be searched in vain to find a more thorough-going illustration of the consequences of "setting a beggar upon horseback." Before the rise of the Union, Wilson was a sailors' lodging-house keeper, in whose exchequer the humble "copper" was in all probability an object of importance. When he became a Trade Union manager (new pattern), tens of thousands of pounds passed through his hands. For a season, he showed himself a master of the modern art of self-advertisement; treating himself to "demonstrations," and manufacturing "public opinion" like a born demagogue. He fomented strikes, he posed as an archetype of the working man—that much-abused ideality—and kept the "band playing" vigorously. He got into Parliament, patronized Cabinet Ministers, and for a time exhibited what our American friends would describe as a remarkable example of "swelled head." Alas for Wilson, the tyrant of Cardiff, Southampton, and half-a-dozen other ports! He is down now; and, for a season at least, we need not fear to see his like again. Would that the men who are peculiarly liable to become the tools of such individuals could take warning from this illustration of the untrustworthiness of those who set at naught the rights of others! Wilson tried his hardest to trample law and justice under foot in the alleged interest of his Union; and all the time he was, on other accounts, the worst enemy the cause of the Union ever had. Truly the career of the agitator is apt to be short. Few of the order keep their places longer than a year or two; and still fewer slip back with credit into their original obscurity.

Proposed Reform of Company Law.

THE law of joint-stock companies is so labyrinthine that Mr. J. A. Kelman, well known as a companies' official, should be assured of attracting attention when he writes, as he recently did to the *Financial News*, to explain how in his opinion legislation applying to the formation and working of companies might be amended. Mr. Kelman throws down the gauntlet to the official draftsmen of the Companies' Acts by declaring that these measures, when brought to the test of practical working, have been found

the reverse of intelligible, and have given rise to much litigation and loss. "The decision of Mr. Justice Some-"body has been in direct conflict with the decision of "Mr. Justice Somebody-else; and the result is that we "wander in impenetrable thickets, out of which no "amount of codification or amendment will lead us." Mr. Kelman's first proposition is that the Companies' Acts from 1862 downwards are past all tinkering, and ought to be removed from the statute-book. He then lays down the "one great principle" upon which all future company legislation should proceed, which is this: "To give to "every intending shareholder in a company, at the "time of his application, all the information about "the company that is possessed by the Directors "and promoters, and to state definitely to whom alone "the shareholder has to look for redress in the case of "misrepresentation." From this standpoint he thinks it perfectly possible to frame an Act which shall be at once simple, intelligible, practical, reasonable, and just. To this end, the Memorandum of Association is to be abolished; and there is to be no definition of the objects of a company, which is to be permitted to do all that an individual may do. There should be a "statutory "prospectus," containing, among other things, all that is now included in the Memorandum of Association, and statutory Articles of Association, both to be printed in full on the back of every prospectus. Mr. Kelman would get over the difficulty of fixing the responsibility for misrepresentation by requiring to be filed at Somerset House, on the registration of every company, the names of the persons who hold themselves liable for misrepresentation. He further proposes that the parties at present called the promoters of companies should be called negotiators; and that these parties to bringing out a company should be paid according to a scale of fees based upon the subscribed capital. Moreover, the various prices at which the property may have changed hands during the previous five years would also be disclosed upon the prospectus. Lastly, in view of the large fees now payable for the registration of joint-stock companies, Mr. Kelman thinks some return should be made by the appointment of an official at Somerset House to settle all disputes arising under the new Companies' Act, without appeal. The foregoing programme does not lack boldness of suggestion; but there are many questions actually springing up in connection with the floating and administration of joint-stock enterprises which it does not touch.

The Employers' Liability Bill as Reported.

After a weariful week of further discussion in Committee, during which the Government experienced more than one perilous shock, the Employers' Liability Bill was duly reported and ordered to be printed "as amended by the "Standing Committee on Law and on Consideration." The third reading is fixed for next Thursday; and then the measure will go to the Lords, who are threatened by some newspapers with the usual terrors if they should dare to meddle with a scheme of legislation which only scraped through the House of Commons by virtue of a remarkable display of cross-voting. As it stands, the Bill does not appear to warrant by its length the amount of talking that has been poured over it; but yet, when certain of the clauses are examined, they will be found to bear the marks of severe handling. It will not be surprising if, when the Bill is returned to the Commons with the Lords' amendments, these are found to deal with other points than the crucial matter of contracting out. For instance, the Bill makes an important inroad into some established practices and rules with regard to litigation, with the praiseworthy object of limiting the operations of the speculative attorney, who, as the Home Secretary stated in the House, has made himself a plague of poor suitors. This is all very well; but it is open to anyone to remark that setting up new rules for litigation under a particular statute, for the special behoof of one order of the community, is a very lame way of attacking a general evil, and has the drawback of creating a cause of confusion which may be more productive of harm than of good. In the meantime, it is hardly worth while to discuss the Bill at length in its present stage. It is a curious result of the difference between the English and Scotch judicature systems that almost as many words are required to explain how the Act is to be worked in Scotland as go to the rest of the Bill.

WATER AND SANITARY AFFAIRS.

In respect to the Water Supply of the Metropolis, the London County Council are now distinctly adopting a policy of obstruction. This appears both by the proceedings of Tuesday last, and by the "Memorandum" published in another part of our columns, concerning which something more is to be heard. As we signified last week, the Metropolitan Water Companies are prepared to extend their works in all cases where it is necessary or desirable to do so, in order to secure that the supply shall be equal to the growing wants of the population. The report lately presented by the Royal Commission shows, with sufficient clearness, on what lines this can be done; and the Companies are ready to proceed accordingly. The present supply is approved as to its quality; and the Commissioners estimate that sufficient can be obtained from the watersheds of the Thames and the Lea to make London secure against any scarcity for forty years to come, with the chance of that period being considerably extended. But now the County Council are going to rush in, for the avowed purpose of preventing the Water Companies from fulfilling the expectations of the Commissioners. A Bill is to be brought into Parliament, conferring power on the Council "for the acquisition of "such areas as may be needed for the supply of water to "the Metropolis." Apart from the idea of furnishing a complete supply, it is urged that "an additional" one is required, to meet the growing demand. At the same time, it is not pretended that this action on the part of the Council is rendered necessary by any dilatoriness displayed by the Companies. On the contrary, alarm is taken at the promptitude with which the Companies are entering on the fulfilment of their duties. Lord Farrer is reported as saying "there were suggestions in the report "of the Commission as to the places where water can be "got in Kent and elsewhere, and places where reservoirs "may be constructed." "It may be," he added, "that, "during the next session, the Water Companies may "come to purchase those areas." In view of such a contingency, his Lordship argues that "the Council should "be beforehand in making themselves masters of any "new sources of supply." But why? Does any public interest demand this step? Will the introduction of an enlarged supply be expedited by this manœuvre? Rather, is it not apparent that this proceeding on the part of the Council is calculated to produce a delay amounting to several years? "We pledge ourselves to purchase nothing," says Lord Farrer. "We are very much in the dark "as to where our new supplies of water are to come "from." The Water Committee, therefore, are not much enlightened by the report of the Royal Commission. It is evident they do not care about the report. They pretended some time ago that they were going to study it very carefully, and lay the result before the Council "at "no distant date." This was all *finesse*. They intended nothing of the kind. "We purposely postponed this "matter," says Mr. Bassett Hopkins, the Chairman of the Committee—that is, they postponed the disclosure of their scheme, or rather their plot.

What is the scheme which is now divulged? No plans are prepared; no areas are scheduled. These are things the Council know nothing about. All they propose to do for another twelve months is to put their parliamentary train on the line, to block the way of the Water Companies. The Water Committee intimate that they mean to be vague and indefinite for the present, so as to avoid raising the value of the land which they may possibly seek by-and-bye to acquire. But they must know that, before they get the land, or the water rights, or anything else, they will have to drop the idea of being, as they say, "as general as possible." Looking a little farther ahead, let us consider what the Council can possibly have in view, supposing they get their "General" Bill passed in the coming session. That will be the first step; what is to be the next? There are certain members of the Council who "want to know." Mr. Beachcroft thinks that it is possible they may find themselves in Wales; while Colonel Hughes thinks it may be Kent. The latter is a good guess. Can the County Council have the conscience to make reservoirs in the Thames Valley, and the valley of the Lea, after all they have said against such sources of a water supply? Yet the Bill of which they have given notice includes the power of supply to all

London and "the neighbourhood." For this purpose the Council are to be enabled to establish new water-works, or to buy up any now existing. The project is put forth "with a view to the future supply of water to the "Metropolis." Where the water is to come from is undetermined; and where it is to come in is still more obscure. On this latter point there seems to be an idea, both in the parliamentary notice of the Bill and in the "Memorandum," that some of the undertakings of the Water Companies may be bought up. The "Memo-"randum" goes far enough to advocate that the entire water supply of the Metropolis should be in the hands of the County Council; and, of course, this is the object throughout. The terms of purchase are shadowed forth in the usual confiscatory fashion.

The intended application by the West Middlesex Water-Works Company for further parliamentary powers—an intention briefly alluded to in last week's JOURNAL—will undoubtedly involve the Directors in an extremely arduous contest. The proposal to go to Parliament with a new Money Bill is not the outcome of any sudden impulse. On the contrary, it has been foreseen for some years past that this application would be necessary; and, but for the hostility of the London County Council, and the unfavourable attitude of the Legislature, the Bill would have been promoted long ere this. The Chairman, speaking at the recent meeting of shareholders, frankly said that the Directors would have gone to Parliament four or five years ago but for the circumstances indicated above. In the exercise of a very wise discretion, however, the step has been postponed until the latest possible moment. It can no longer be delayed; and, as the happy result of the recent Royal Commission, the Company will be enabled to present their case with infinitely greater force than would have been possible last year or the year before. The contention of the County Council as to the quality of the water supply stands condemned by the authorized representatives of Parliament itself. The Companies are acquitted of indifference to the needs of their consumers. They are, moreover, still in possession of the field, and charged with the statutory duty of meeting the ever-increasing requirements of their several areas of supply. With what show of reason, then, in these circumstances, can Parliament refuse to empower them to raise additional capital? Yet it is certain—and Sir W. H. Wyatt and his colleagues are fully alive to the certainty—that the County Council will, at the ratepayers' expense, oppose and seek to thwart the Company in every possible way.

It is impossible to say how far the tactics of the wire-pullers may succeed. But, at any rate, the true character of their proceedings should be recognized. Unconvinced because the verdict of the Royal Commission does not accord with their own views and desires, embittered rather than chastened by their defeat, the fussy body which would fain have a finger in every pie, will certainly return to the charge with redoubled resolution and animosity. More likely than not, Parliament will determine to deal with the Company in a spirit of compromise. Constrained not to cripple their operations altogether, and yet anxious to throw a sop to Cerberus, the parliamentary authorities will probably give the Company some of the powers they want, and refuse to sanction the raising of the whole of the additional capital which the Chairman referred to as necessary to provide for additional storeage and other purposes. This, of course, would suit the County Council better than the concession of the full powers for which the Company have occasion. It will necessitate a further application to Parliament at no very distant date, and thereby afford an opportunity for renewed opposition and hostile criticism. Needless to say, the duel between the West Middlesex Water Company and the Spring Gardens meddlers, or between the latter and any other Water Company that may be forced to go to Parliament in the ensuing session, will be watched with the keenest interest and anxiety by Companies who are not immediately concerned, but whose turn will come presently. Unfortunately, too, the valuable influence of public opinion in favour of what is just and reasonable will be wanting. This is unavoidable, and springs from the very nature of the case. The public have not been educated up to a true estimate of the situation. They are blinded by the frequent and silly reference to "water "monopolists." The newspapers still lend themselves to the development of agitation against water suppliers whenever a wrong-headed consumer is ordered to pay what he owes; and thus it comes about that, year after year, the Companies, bound as they are to meet the growing requirements of the population, find that their position is one of increasing difficulty and embarrassment.

The Bill for the re-constitution of the Thames Conservancy will evidently be of more than ordinary magnitude, judging by the portentous length of the notice which has been published concerning it. Among a multitude of other things, power is sought to continue, reduce, or increase the present number of Conservators, and to abolish or alter the right of any person to be a Conservator, or of any body or persons to nominate, appoint, or elect Conservators. Provision is also to be made for placing on the Board the representatives of other bodies or persons than those hitherto recognized. In agreement with the recommendations of the Royal Commissioners, additional powers are sought for protecting the river from pollution, including the inspection of sewage works and farms. The important question of funds is met by a proposal for contributions to be made to the revenues of the Board from a large number of authorities and Water Companies. The range of the Conservancy comprehends the whole course of the Thames, from its source at Thames Head in Gloucestershire to Yantlet Creek in Kent. The measure is one of a very comprehensive and far-reaching character, touching a vast number of interests; and it will doubtless give rise to a large amount of discussion. In the "Memorandum" drawn up by the Chairman of the County Council Water Committee, apprehension is expressed that "serious conflict and difficulty" may arise in settling the relations to be established between the new Conservancy Board and the Water Companies. This conflict, however, is evidently to be brought about by the Council, who will seek to limit the powers and privileges of the Companies as affected by the Conservators.

Presentation to Alderman Taylor, of Rochdale.—The Corporation of Rochdale have presented the freedom of the borough and his portrait to Mr. Alderman Edward Taylor, the "father" of the Council, who took a prominent part in connection with the transfer of the gas-works to the Commissioners.

Death of M. Maillet.—The current number of *Le Gaz* contains a notice of the death of M. Charles Maillet, one of the officers of the Paris Gas Company. The deceased commenced his professional career with an architect. He entered the Company's service in 1863 as inspector of main-laying; and he subsequently filled several important positions up to the time of his death, which occurred at the comparatively early age of 57.

Manchester District Institution of Gas Engineers.—The 96th quarterly meeting of this Institution will be held next Saturday, at the Palatine Hotel, Manchester, under the presidency of Mr. W. R. Chester, of Nottingham. We learn from the circular issued by the Hon. Secretary (Mr. S. S. Mellor, of Northwich) that the business to be transacted will include the election of the President for the ensuing year, and the reading of a paper by Mr. John Chadwick, of Oldham, on "The Stacking of Coal, and Coal-Haulage Machinery."

The William Livesey Testimonial Fund.—Our readers will see, by the list which appears in our advertisement columns, that the total amount of the subscriptions to the above fund was £697 9s.; the expenses incurred having been £12 7s. 6d. The balance has been applied in a manner calculated to secure the greatest benefit to Mr. Livesey; and the Committee desire to tender their sincere thanks to those who have kindly assisted them in carrying out their object. Should any subscribers desire particulars, the Honorary Secretary (Mr. Corbet Woodall) will be pleased to furnish them.

Junior Engineering Society.—The opening meeting of the thirteenth session of this Society was held at the Westminster Palace Hotel on the 10th inst., when the new President (Mr. J. Wolfe Barry, one of the Vice-Presidents of the Institution of Civil Engineers) delivered his Inaugural Address. At the next meeting, Mr. S. Cutler will read a paper on "Coal Gas Manufacture, and Recent Improvements in the Plant employed therein;" and among the other papers in the programme for the session is one by Professor Vivian B. Lewes, F.I.C., F.C.S., on "Boiler Incrustations and Deposits."

Society of Arts.—At the opening meeting of this Society for the present session, which took place last Wednesday, the Chairman of the Council (Sir R. E. Webster, Q.C., M.P.), at the close of his Inaugural Address, presented the silver medals awarded by the Society for papers read last session. Among the recipients were Professor Frank Clowes, for his paper on "The Detection and Estimation of Small Proportions of Inflammable Gas or Vapour in the Air;" Mr. Gisbert Kapp, for his paper on "Some Economic Points in Connection with Electric Supply;" and Mr. W. Key, for his paper on "The Purification of the Air Supply to Public Buildings and Dwellings."

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 952.)

At length it is possible to point to a rather better state of things on the Stock Exchange; and the clouds which have so long been overhanging have parted sufficiently to show a little blue sky. After a somewhat hesitating opening, the course of things gradually improved during the week, and closed with a generally favourable tendency. This was promoted, in the first instance, by the settlement being satisfactorily adjusted, and by a closing of "bear" accounts; while the condition of the Money Market was all that could be desired. Then, relief was beginning to be viewed ahead through the success of the conference on Friday, which effected a settlement (at all events for some little time to come) of the internecine and devastating coal strike. However, the week was not entirely free from sinister incidents; and a remarkable illustration of the proneness to take fright, and of how ticklish is the financial situation was furnished by the ridiculous Bank of England scare, fostered, if not in the first place started, by interested prophets of evil. The fact appears to be that some engagements, not of the most prudent order, and which might better have been left to the outside market, had been undertaken; but the very exaggerated rumours to which they gave rise were simply preposterous. The Gas Market meanwhile was particularly quiet in the earlier portion of the week, but brightened up into more activity later on. Quotations have been irregular in their movements, some up and some down, influenced mostly by the quantity of stock on hand. Recent depressions have been mainly caused by some enforced realizations; and, where these have been completed, a recovery set in. The rest have to wait. In Gaslights, the "A" has jumped smartly up—opening at 222½, and closing at 229. Business has been scarcely so brisk in the secured issues; but they are very firm, as all the good things are now. South Metropolitans are among those which must wait a little longer before they get a recovery; quotations being still rather against them. Commercials were quiet, without moving, and waiting for the rise. The Suburban and Metropolitan Companies were not affected either way; and quotations did not stir. In Continentals, Union were steady. European dropped ½, but, finding no more stock coming forward, recovered again; and Imperial had a further fall. The Indian Companies, Bombay and Oriental, will each reduce their dividend in order to balance the loss on exchange owing to the depreciation of silver. The report and accounts of the latter Company are out, and show nevertheless good progress with the business—a strong point which the vagaries of the silver market cannot touch. Of the rest, Cagliari and Buenos Ayres debentures are higher. Water continued rather low; and East London and Lambeth fell a little more.

The daily operations were: The Gas Market was very quiet at the opening; and prices on the whole were lower. Imperial and South Metropolitan "B" fell 1 each; and European, ½; but Monte Video rose ½. Lambeth Water fell 1½. Tuesday was scarcely more active; but quotations for gas did not move, though East London Water was 2 lower. Wednesday was quite featureless, except for the prospect of better things in Gaslight "A." On Thursday dealings in that stock were brisk; and the quotation rose 3. Friday was the liveliest day of the week. Gaslight "A" improved 2; Buenos Ayres debentures, 1; and European recovered its lost ½. But Imperial lost 1; and South Metropolitan "C," 3. Saturday was quiet and unchanged.

ELECTRIC LIGHTING MEMORANDA.

Electric Lighting in the Streets of the City of London—The Business of the Metropolitan Electric Supply Company—The Incandescent Lamp Trade—Electropathic Quackery.

The proposal to extend the electric lighting in the City of London to include Crutched Friars, which was noticed in a news paragraph in our last issue, afforded an opportunity for Mr. C. T. Harris to call the attention of the Commissioners of Sewers to the expense of the system. The proposal was eventually referred to the Streets Committee, but not before Mr. Harris had succeeded in putting upon record the fact that the City is being drawn into paying between three and four times as much for the electric lighting, so far as it goes, as was formerly paid for the whole of the gas lighting. And even then the electric lighting will only be partial. Of course, if the Commissioners prefer to spend the ratepayers' money in this way, and the public are content to have it so, there is no more to be said. But it is just as well that the truth respecting the cost should not be lost sight of; for the electricians are as keenly desirous as ever to spread the delusion that electric lighting costs no more than gas. It is noteworthy that at the same meeting of the City Commissioners of Sewers at which the preceding matter was considered, a report of the City Engineer upon the failures of arc lamps in the streets, also given in our last issue, was received, and ordered to be printed and circulated. Several serious interruptions of the service were recorded in this return, all of which were explained by the Company. In one case, a belt broke; in another, a stoker was guilty of negligence; in a third, the blame was put upon a defective switch. The nature of these excuses is as instructive as the incidents to which they refer. They all go to show that the continuance of the service depends upon the integrity of a number of minute details, and that, so far as assuring public lamps against failure is concerned, the present arrangements are little better than those with which the City was painfully familiar ten years ago.

The Directors of the Metropolitan Electric Supply Company have deemed it desirable to circulate among the shareholders a statement of the Company's position, which claims among other things that the increase of business is being satisfactorily maintained. This piece of news must be very gratifying to the proprietors, in view of the disquieting intelligence that has been published with regard to the arrest of development in another London venture of the kind. It is reported that the number of lamps connected to the Metropolitan Company's system, which in November last was 114,656, and at the date of the general meeting in April last 134,453, is now 157,556, besides applications in hand for the supply of current to 7557 lamps. This is a very good showing indeed; and it may be interpreted as an indication of the valuable character of the Company's district, which is fast being rebuilt with palatial blocks of office and residential chambers commanding high rents. We are quite prepared to believe that the regions of West Central London covered by this Company's system will be among the last to show signs of saturation in respect to electric lighting. The Directors also declare that the gross revenue of the undertaking for the last six months shows a very satisfactory advance upon that for the corresponding period of 1892; while the working expenses for the same period fully bear out the views which the Board have frequently expressed as to the small additional cost of production as compared with the increased revenue earned. It is high time that some such result was obtained, for the working expenses of the concern have been on a more magnificent scale than even its prospects; and its shares are not yet quoted at par.

The retailers of incandescent electric lamps have come to the front with a rush since the 10th inst., the date of expiry of the Edison and Swan Company's master patent; and, however well they may have been prepared for the advent of the era of competition, this Company must have been slightly surprised at the number of makers of, and dealers in, this specialty who have thrown themselves into the market. One of the most formidable of the new comers are the German Edison Company—or, at any rate, a firm offering what they call the German Edison lamp at the price of 18d. each, subject to discount. As little as 12s. per dozen, "subject," is asked for some lamps, declared to be of first-class quality, both as regards durability and luminosity. These are German goods; but several cheap lamps are offered, "not made in Germany." As we have repeatedly remarked, it remains to be seen what effect, if any, this irruption of cheap lamps will have upon the electric lighting industry of this country; but meanwhile we are disposed to think, with the Secretary of the Edison and Swan Company, that it will not make a vast amount of difference.

The most sensational incident of the week in connection with matters electrical has not had anything to do with electric lighting, but has related to the essentially tricky and frequently fraudulent electropathic trade. A prominent dealer in the so-called medical batteries, who was originally tackled while in the full tide of advertisement-made commercial prosperity by our worthy contemporary the *Electrical Review*, has been made the subject of a tremendous attack by a leading London evening newspaper, and is actually under remand on a charge of obtaining money by fraudulent misrepresentation. We mention the matter here as a topic of current interest, and for the purpose of remarking that, although electropathic quackery has nothing to do with the ordinary purposes of this column, it has unquestionably derived strength from its association, albeit illegitimate, with the modern revival and development of electrical industry. All manner of things have been puffed of late years by the aid of the term "electric;" and the modern representatives of Dr. Sangrado and Dr. Dulcamara have not been behind in taking advantage of the prevalent craze. Moreover, the promoters and conductors of electrical exhibitions both at home and abroad, have not been above helping these quacks to spread their nets in the sight of the unwary bird. One of them had a gorgeous stall at the last Crystal Palace Electrical Exhibition, where a harmless Wimshurst machine was made instrumental in dazzling the public; and the plenitude of so-called electro-medical gimcracks at the Chicago Exhibition was one of the scandals of the place. There is some hope that this particular variety of electrical enterprise will be put under a cloud in England for some time to come; but, unhappily, it would be too much to expect that the sum of human folly and credulity, upon which the charlatans of all ages have thrived, will be sensibly diminished through the discouragement of one means of parting fools and their money.

Sudden Death of an Old Official of the Ipswich Gas Company.—Mr. J. D. Grimwood, the Cashier of the Ipswich Gas Company, while pursuing his duties in the office last Wednesday afternoon, was suddenly seized with apoplexy, and very shortly afterwards died. The deceased gentleman was 57 years of age, and had been in the service of the Company for about 42 years.

TOPICS OF THE DAY.

It is an altogether satisfactory thing for the country and for the world at large, that such incidents as the opening meeting for the present session of the Royal Colonial Institute on Tuesday last, and the inauguration of the new municipal buildings for Battersea, on Wednesday, should occur just now, to furnish some of the leading statesmen of the United Kingdom with opportunities for manifesting their interest in the great administrative problems that are actually occupying public attention. Thus, on the first of these occasions a paper on "State Socialism in Antipodean Britain" was read by the Earl of Onslow, ex-Governor of New Zealand; and a speech by the Earl of Rosebery followed. Next day Lord Rosebery delivered to the Battersea notables one of the bright, luminous addresses for which he is famed, upon the subject of "Municipal Institutions." This is as it should be. The community wants to hear what the highest secular authority has to advance respecting these matters. Speaking in Battersea of the hopeful sign which the erection of public buildings like the local Town Hall furnishes of the renascence of municipal spirit in that Greater London which lies outside the City, Lord Rosebery pointed out how vastly this kind of public energy is to be preferred to the mass-meeting system. We may carry the plea farther, and urge how much better it is for men like Lord Rosebery and Lord Onslow to treat of State and Municipal Socialism in the ears of the people, than for the ignorant to be left altogether to the guidance in such studies of men as ignorant as themselves. We have a special right to urge this contention, for we have, almost alone among technical journals, upheld the right of the workman to the best instruction that can be obtained in political and industrial economics. It was not so very long ago that the mere mention of this class of industrial topics in a technical periodical was generally looked upon as going beyond the proper scope of such publications; and what happened? With orthodox political economy shut out from the daily newspapers in favour of common party politics, and with the industrial Press equally indifferent to the subject, neither employers nor workmen had any convenient means of instructing themselves with regard to the nature or the operation of the principles underlying their ordinary avocations, and determining their commercial relations. This was the opportunity for the agitator, the demagogue, and that curious modern production, the New Trades Union leader. There was, of course, nothing new about agitations for more wages or reduced hours of labour; but the latter-day troublers of the industrial classes did not confine themselves to these matters. They were Socialists or Anarchists first, and labour leaders afterwards; and the greatest mischief they did was in filling the heads of their hearers with a mass of pernicious rubbish relating to the position and rights of the working classes in the community. And all this turned to their own advantage. In the old way of labour agitations, men in a certain employment asked for specific ameliorations of their position, which they did or did not succeed in getting, as circumstances decided. While the negotiations between employers and employed were going on, the latter had spokesmen or representatives who acted on behalf of themselves and their fellows; and when the affair was over, these temporary delegates subsided into their former condition. All this was changed in the New Unionism. The leaders and organizers of strikes were usually men who had nothing in common with the workpeople in whose names they presumed to act, but were demagogues from outside who had succeeded in attaining a certain pre-eminence as glib talkers about the Rights of Man. This Trade Union leadership thus became a profession, eagerly taken to by a horde of spouters who never did a day's manual work in their lives, or who had dropped their tools to follow the more paying trade of agitation; and some of the cleverest of them have done so well at it as to have become Royal Commissioners, County Councillors, and Members of Parliament.

How is it that these blatant street-corner orators have been able to do the industry of the country so much injury and themselves so much private good? Simply because they were sharp enough to take possession of a neglected domain, and work it for their own advantage. They took the ear of the ignorant public with their diatribes against the existing industrial system; and, notwithstanding the heavy and continual failures that have followed their attempts to put their inchoate theories into operation, they have established a sort of reputation for themselves, in all too many instanees, as the accepted leaders of the working classes, and as authorities with whom politicians must reckon. Of course, this will not last. Mutual dissensions, personal weaknesses, the consequences of misconduct and mismanagement, will have their effect upon the agitator class; and the disappointment of those who have trusted in them will be grievous. Meanwhile, it is desirable to prepare the public for this result by showing that the questions of national and municipal administration, of the treatment of which the demagogues claim to have the monopoly, the shortcomings of civilization for which they have professed to possess the sole remedies, are not overlooked by men of the highest culture, position, and influence. This is the reason why we welcome Lord Rosebery and Lord Onslow, and their like, as speakers on Socialism and Municipalism in the ears of the newspaper-reading public.

The Earl of Onslow took up the story of Antipodean labour questions at the point where our recent articles on the same subject left off. He showed how the last great strikes in that part of the world had turned on the point of freedom to labour; and he described the extent to which the working-class vote influences the New Zealand Government. Speaking of the wages question, Lord Onslow said that "he thought the whole of the labour problem lay in the best manner of adjusting the relations between the price of labour and the price of commodities." This is undoubtedly the case. The colliers recently locked out in England wanted wages treated as one of the first charges on production. This is actually so in gas-works; but then the gas manufacturer is protected, and the colliery proprietor is not. It was made clear, from Lord Onslow's remarks and the discussion that followed the reading of his paper, that the Labour party everywhere is Protectionist to the backbone.

Lord Rosebery is never commonplace; but last week he performed with ease the rare feat of beginning a speech upon one subject to one audience on one day, and finishing it upon another subject, to a different audience, in another place, upon the day following; and yet it was the same speech. For whether he was engaged discoursing on Colonial legislative experiments, or sub-Metropolitan municipal enterprise, his theme was still local self-government and experimental legislation. He declared that he was not afraid of experiments in law-making; and he spoke like an embodiment of the spirit of the age in prophesying that "we shall see a good deal of experimental legislation in this country before we are many of us very old." It is not difficult to place oneself sufficiently *en rapport* with the noble county councillor to see some of the phantasmagoria of prospective measures that flitted across his consciousness while these words were passing his lips. "Betterment," the taxing of ground-rents, the municipalization of gas and water supply and tramways—these and many other subjects must have entered into the spirit of his Lordship's dream of the moment. He went on to observe that "although it is always easy to expose these experiments to much criticism and to more ridicule," he thought it should be remembered that "even when these experiments do not at first sight appeal to the more refined philosophy of matured politicians, they have at any rate this recommendation—that they are carried on by deputies in the spirit and at the instigation of those by whom they are elected; and that, strange as it may seem to those who criticize from a loftier standpoint, the vast majority of the people will for the moment prefer being even a little misgoverned by themselves to being much better governed by other people." In another place Lord Rosebery remarked of something done by the working classes of Australia, that "it may be wrong from a politico-economical point of view; but they cannot see the eternal causes which guide humanity." There is enough in these passing remarks to supply texts for a whole treatise on the duty of the elevated and the educated in regard to instructing the ignorant. The power of the vote rests with the multitude; but wisdom remains the privilege of the few. Yet it is the few wise that must govern, if the State is to be well administered; and they can only do so by securing the suffrages of the many. Lord Rosebery says that experimental legislation may be expected in the near future. So be it. There is nothing in the idea of experimental or unprecedented legislation to frighten any sensible man, provided that a case can be made out for its expediency, and that it does not transgress established laws. The difficulty is that ignorant men regard every fancy that occurs to themselves as novel, and an element of progress, and are apt to ignore the probability that the wise old world has forgotten more than they ever knew. What is to be guarded against is the possibility, which amounts to a probability, that municipal parties will give the style of "Progress" to projects which are essentially reactionary and obstructive, unless the crudities of popular representation are corrected by that ripe wisdom which, unhappily, is seldom popular. It is all very well to make legislative or municipal experiments by the desire of the people, provided the people are instructed beforehand as to what it is right and proper to ask for. We do not object to the aphorism that most people would rather misgovern themselves than be well governed by others. But all the same it is desirable, for the sake of all parties, that there should be as little misgovernment as possible; and for this cause the world of voters must be led to understand what Lord Rosebery calls "the eternal causes which guide humanity." It is quite conceivable that a misgoverned race may be stronger and better than a perfectly-organized and properly administered State, if the former is the accompaniment of liberty and the latter a product of despotism. But mistakes in government are too costly to be lightly regarded, even for the sake of pointing an argument. After all, misgovernment means tyranny.

Lord Rosebery told the Battersea people that, so far as the movement has gone, municipalization has been "an unmixed benefit." But he also said that it is "not a principle of unlimited application;" and in this most people will agree with him. He admitted that some admirers of municipalization would go farther than he could; yet the speaker must have been prepared to go pretty far in this direction, for he did not draw the line short of the preservation of the independence of the individual, which he thought is in danger from the irresistible desire of the public to know all about their eminent contemporaries. There is, however, a measure of safety in this

curiosity; for the public wants to be served by the best men, and the ages are past when statesmen could pose before the world as models of public virtue, while their private character was unfit to bear the light of day. "No man can act in a public position," said Lord Rosebery, "without feeling that his life has ceased to be his own." This is true; and the only thing remaining to be said about it is that the condition is perhaps capable of turning more to the good than to the detriment of the individual subjected to it.

NOTES.

Gas Analysis by Sound.

A novel method of analyzing mixtures of two gases of different densities has been brought under the notice of the French Academy of Sciences by M. Hardy. It depends upon the application of sound vibrations; and the apparatus is called by its inventor a formenophone, because it is primarily designed for the purpose of determining the proportion of formene, or fire-damp, in the air of coal mines. This appliance consists of two organ-pipes, of exactly the same dimensions, and giving out the same note when blown with air under ordinary conditions. If one of these pipes is filled with normal air, and the other with air containing (say) 1 per cent. of marsh gas, and the pipes are then sounded, the unison is disturbed, and one beat is heard every three seconds. With 2 per cent. of marsh gas in the air, there are three beats in two seconds; with 3 per cent., two beats per second; and so on. Similar results may be obtained when carbonic acid gas is the added impurity. M. Hardy gave figures of determinations with organ-pipes sounding C_4. For mixtures having a density closely approaching that of air, pipes sounding C_5 are more suitable. Each determination is the work of a few seconds; and the inventor believes the apparatus to be of great practical value for the analysis of suspected air taken from mines or other enclosed spaces. It is interesting to note, in connection with this communication, that the phenomenon upon which M. Hardy's method is based is a well-known concomitant of organ performances in concert halls or churches where the air is liable to marked carbonic acid pollution through lack of proper ventilation. At the close of a crowded assemblage in such places the organ-pipes give quite a different pitch of sound from that with which they began.

A Question of the Volatility of Sulphuric Acid.

A point in chemistry of considerable practical importance is discussed by Mr. George Stillingfleet Johnson in a recent issue of the *Chemical News*. It refers to the question whether sulphuric acid is really not volatile at the ordinary temperature of the air. This fluid is usually credited with not giving off any vapour at ordinary temperatures; but a question was raised in regard to this matter before the Chemical Section of the Franklin Institute in 1891, when certain experiences were cited to show that, in some circumstances, an action has been exerted by sulphuric acid upon materials standing near or over it which lends colour to the suspicion that the fluid may be volatile in some degree. The question is not without a bearing upon the much-debated appearance and action of sulphuric acid in gas-lit rooms. Mr. Johnson states that he has investigated the matter by a series of experiments, which he describes at length; and he has arrived at the conclusions that sulphuric acid is certainly not volatile at ordinary temperatures, even in a good vacuum, but that it is liable to vitiate the results of experiments if exposed to reducing vapours, which may be derived from the grease used to keep stoppered glass vessels air-tight.

The Porosity of Glass.

Some interesting experiments going to show that glass is more porous, under some conditions, than it has hitherto been considered, have been carried out by Messrs. E. Warburg and F. Tegetmeier. These experiments are described by Professor W. Chandler Roberts-Austen as demonstrating the possibility of producing eventually a degree of porosity in vitreous bodies which will admit of the passage of elements having comparatively small atomic volumes, while other elements having larger atomic volumes are strained off; thus occasioning a mechanical sifting of the elements. A receptacle was divided into two compartments by a sheet of glass, which could be several millimetres thick. Sodium amalgam was placed on one side, and pure mercury on the other; the whole was then heated to the moderate temperature of 200° C., at which the glass becomes slightly conducting. The positive and negative wires from a Planté battery were then respectively placed in connection with the contents of the two compartments; and it was found at the end of 30 hours that a considerable quantity of sodium had passed into the mercury through the glass, which had nevertheless preserved its original weight and transparency.

The Performance of German Coke-Ovens.

Reporting to his Government upon the remarkable recent advance of Germany as a great iron-producing country, the Consul-General for the United States at Frankfort explains this result as being largely due to the application of chemical skill to the recovery and utilization of the bye-products of coke manufacture. It is stated that the difficulty formerly urged as standing in the way of this economical process—the injury to the quality of the coke—has been overcome in the "Otto" type of coke-ovens now almost exclusively used in Germany. This oven is described as being 32 feet long, 16 inches wide, and 5 ft. 6 in. high. The most economical arrangement is a battery of sixty of these ovens; each alternate one being drawn and charged every 48 hours. The charge is tipped in from above through three openings, and weighs 6½ tons. A Siemens regenerator furnace plant supplies the heat, which is partly obtained by burning the gas given off from the charge after it has been condensed, washed, and in some cases treated for the extraction of benzol. An average carbonizing result is, with Silesian coal, 1500 lbs. of coke, 93 lbs. of tar, 26 lbs. of sulphate of ammonia, and about 6000 cubic feet of gas per ton. The Silesian coal appears to be the best for gas, the output of which is at least one-third in excess of what is needed for heating the ovens. These figures are cited to show that the German iron and coke manufacturers can afford to credit their actual cost of production with a large sum, the result of the recovery and sale of bye-products.

The Photometry of Differently Coloured Lights.

Discussing the photometry of lights of different colours, the *Electrician* recently remarked that the well-known difficulty which arises in comparing the relative candle power of two lights which differ in tint, is often overcome by the use of red and green glasses. The objection to this method is that it gives two results, neither of which is the one wanted, and which cannot be combined together to yield the value required. The true illuminating power can only be estimated by judging the intensity of the two parts of the photometer disc in spite of colour differences; and after a little practice this can be done, it is said, with a degree of accuracy quite sufficient for most purposes. It is remarked that the difference of colour between the lights which are being compared always appears greater than it really is, owing to a peculiar optical effect, the reason for which is not yet satisfactorily made out. It is well known that dark spots on a coloured background appear coloured, of the hue complementary to that of the background. Thus black spots on a reddish ground appear green; while if the ground is green they seem to be red. This is what occurs with the Bunsen photometer, when the lights compared are of different colours. The discovery has recently been made that the perception of these effects is instantaneous, and is therefore not due to any adjustment process of the organ of vision, nor is it the result of fatigue. They can be seen by the light of an electric spark; and the suggestion is offered that probably what is necessary to see these effects is not so much a mimium interval of time as a minimum amount of illumination.

A Legal View of the Bath Question.—The following remarks on the position of suppliers of water in regard to charging for baths, appeared in the *Law Times* on the 11th inst.: "The controversy with respect to certain provisions in the Lambeth Water-Works Act, 1848, which has been referred to in a morning paper, involves monetary issues of considerable importance. The Lambeth Company, it seems, in common with nearly every other company or corporation acting as suppliers of water, is in the habit of making an extra charge for water supplied for fixed baths in private houses. *Primâ facie*, this would form part of the supply for domestic purposes, in respect of which a fixed rate is payable according to the annual value of the premises. But it is the general contention of the companies that their Special Acts sanction an additional charge for water required for fixed baths. In the Lambeth case, it was enacted that a supply of water for domestic purposes should not include a supply for 'baths, horses, cattle, or for washing carriages, or for any trade,' &c. How is the word 'baths' to be interpreted? Descriptive adjective there is none. The Act does not say 'public' baths; nor does it necessarily imply that 'horses' shall mean only horses let out for hire. A similar question was raised in the case of *The Sheffield Water-Works Company v. Bingham*, which, however, had reference to section 14 of the Water-Works Clauses Act, 1863—an enactment providing that, where the company supplies water by measure, it may let to a consumer a meter for such remuneration as may be agreed upon. Mr. Justice Pearson decided in that case that a consumer taking water for a fixed bath in his private house was bound, at his own expense, to measure the water so used, and to record from time to time the amount taken. (See also *The Sheffield Water-Works Company v. Carter*.) Somewhat more in point, however, is *Weaver v. Corporation of Cardiff*, in which the argument turned on the words 'water for baths, wash-houses, or public purposes.' Mr. Justice Field considered that 'baths' must, with reference to the context, be taken to mean a public establishment of baths, and that 'public purposes' should be read as meaning *other* public purposes. His Lordship distinguished the case from *Sheffield v. Bingham* on the ground that the words of the Special Act in that instance were different. So, too, in the case of Lambeth, it will be noticed that the words are differently ordered; and there seems to be slenderer ground for contending that 'baths' in the Lambeth Act must necessarily mean baths in a public establishment. The various Special Acts may be variously interpreted; and, meanwhile, the extra rate for baths, paid without protest in most instances, means a special income of many thousands a year to the companies and corporations."

COMMUNICATED ARTICLES.

GAS UNDERTAKINGS AND THE PRICE OF COAL.

By Norton H. Humphrys, Assoc.M.Inst.CE., F.C.S.

For many years past the policy pursued by gas engineers and managers of gas-works has been one of advance and retrenchment. They have worked with one end in view; and that has been "cheap gas." They have designed improved methods of dealing with the coal in the first place, in order to ensure its distillation under the conditions most favourable for producing the largest possible quantity, and the highest quality of gas; and having generated this product, have followed it through the operations of condensation, washing, purification, storing, and distribution, right up to the consumer's meter—searching carefully for economy or for improvement at every step. As indirectly helping to the same end, they have sought to improve the markets for their residuals, and have taken up the breaking of coke, the distillation of tar, and the manufacture of sulphate of ammonia. The primary object in view has not been the increase of profits. Outsiders who do not understand the working of gas undertakings might well suppose that the only goal was that of larger dividends for the shareholders. Some gas undertakings are only entitled to fixed rates of dividend, and therefore gain no direct benefit from these endeavours; while others, working under the sliding scale, obtain a direct advantage to a small extent, in being entitled to divide an additional unit per cent. of interest for every 4d. reduction in price. But even under the regulations of the sliding scale, it has not been so much a question of increased profit as of popularizing the use of gas, finding fresh outlets for its consumption, and leading to the establishment of a large and steady trade, that would enhance the stability of the undertaking and the security of the capital invested.

If these ideas are anything beyond a chimera, and if the object that has claimed attention for so many years is a substantial one, and not merely a will-o'-th'-wisp, then it follows that the state of affairs prevailing in the coal market, considered in connection with the events that have led up to it, is a terrible check that bodes ill for the future of the gas industry. The much-belauded reduction of leakage, the economy in purification, and the saving in the retort-house are all like straws before the wind, as compared with the recent advances in the cost of coal; and the economies of the last quarter of a century are to go, not to the consumers or shareholders, but into the pockets of persons interested in the coal trade. I say this advisedly. If gas had remained at 5s. or 6s. per 1000 cubic feet, the demand for it, and consequently the demand for gas coals, would not have amounted to one-half of the present consumption. But for the existence of such a large demand, it would be impossible to cut such discreditable antics as are now to be seen in the coal trade; and thus the exertions of gas engineers and managers have been so far perverted, as to go to form a rod for their own backs.

We know very well the position that will be taken up by the sellers of coal, when confronted with considerations such as the above. "Please, sir, it wasn't me; it was the other boy," is an excuse that commences at an early period in our educational training, and is frequently found convenient in after-life; and in this case, "the other boy" is the miners' delegate. During the last six years, it is admitted that the miner has received an addition of 40 per cent. to his wages. At the outside, this does not represent so much as 2s. per ton of coal. The wages agitation has formed a convenient bogey for extortion. With every increase to the miner, an addition of several fold has been made to the consumer. If the miner received 6d., coal has been raised from 1s. 6d. to 3s. per ton; and the increase said to be necessitated by the rise in wages approaches towards double the total sum disbursed under that item. It does not appear that the acceptance of a reduction in wages by the miner would be any guarantee for coal at a fair price.

A common fallacy is the idea that, after all, the price of coal is not a very important question in relation to the finances of gas companies, because a large proportion of it is recovered by the sale of residuals. This is quite a mistake; the only residual that is affected by the price of coal is coke. For every ton of coal carbonized, about half a ton of coke remains for sale; and it would be putting the case too favourably to say that the price of coke followed closely on that of coal. With coals at 16s. per ton, coke will realize about 12s.; and with coals at 24s., it will perhaps fetch as much as 18s. In the first case, it returns 6s.; in the second, 9s. Out of the 8s. extra for coal, therefore, only 3s. is returned; and in actual practice, only about one-fourth of the increased price is recouped by the residuals. An increase of 6s. per ton in the net cost of coal means an additional charge of about 8d. per 1000 cubic feet of gas, which is equivalent to a very large portion of the profits—in some cases, to the whole. This is sufficient to show that the importance of the price of coal, in relation to the prosperity of gas undertakings, has not been overstated.

The position of gas companies as consumers of coal, has occupied a prominent place in the considerations of miners, labour agitators, and those who are in a position to influence the selling price. The first article in the creed of such persons is the proverb, "One man's necessity is another man's opportunity;" and the facts that gas must be supplied to everybody who demands it, under penalties relating both to quality and to quantity, and that this cannot be done without a supply of the proper kind of coal, have led to the marking of gas undertakings as fair game for plunder. To sell gas coal cheaply, is looked upon as a blunder worse than a crime. To buy coal cheaply is not much better; and the person who does so, is regarded as deserving of no consideration. The gas companies must have the coal; and where the extra cost is to come from, is a matter that is disposed of in a very loose way. Sometimes the convenient myth of exorbitant profits is trotted out, just as if the earnings could be depleted to the extent of 8d. or 9d. per 1000 cubic feet of gas, and yet leave a remainder equal to a fair dividend. In the event of this source failing, it is hinted that the consumers should pay more for their gas.

The coal supplies for gas undertakings have always been independent purchases in the open market. They have made no attempt, either individually or in combination, to control prices; and the worst that has been done is the inviting of competing tenders. If at any time the coal has been secured at less than a fair price—that is, at a figure too low to admit of both a fair wage and a fair profit—the fault does not rest with the buyers, nor is the transaction of their seeking. But there must be a limit to this forcing of prices by sellers; and the events of the last few months tend to show that such limit is likely to be reached. Not only so, but coalowners and miners stand confessedly unable to devise any arrangement that will admit of a reliable and reasonable coal supply. If the question of price was not of moment, the irregularity in delivery, the holding back of promised supplies in the hope of disposing of them to greater advantage elsewhere, the repudiation of contract responsibilities while yet holding a large stock in hand, and the inferior qualities of coal that are being supplied, are matters that claim serious consideration on their own account. The losses now being suffered by gas undertakings extend beyond the actual additional cost of coal.

But what is a "fair" price? No one wants to see the miner ground down to a mere living wage, or the owner receiving less than a fair business rate of profit, equal to that earned in other branches of commercial enterprise. What is the lowest price that will admit of both reasonably good wages and profits? Sir G. Elliot has answered the question for us. In the course of his well-known consolidation scheme, he mentions 7s. 11d. per ton as a sum that complies with those conditions. No one has complained that this estimate is too low—indeed, some have thought that it is excessive. Then the question of the day, for gas undertakings, is this: If 8s. per ton is a fair price at the pit, why are we called upon to pay 12s. to 15s.? They are entitled to a square answer. The side issue, of who appropriates the extra 50 to 100 per cent. profit, is also interesting. The next thing to find out is whether this heavy tax on coal is a matter that must be endured, or if it can be cured. The aggregate coal bill of the gas undertakings throughout the United Kingdom must amount to an enormous sum; and when a large percentage of it is called in question, neither trouble nor expense should be spared in probing the matter to the bottom. Some time since there was reason to believe that, owing to the operations of speculators, gas companies did not receive a fair price for one of their residuals—sulphate of ammonia; and an Association of Sulphate of Ammonia Manufacturers was established, which still exists. If the price of sulphate is a matter worthy the attention of a society (and those who have read the reports issued a short time since, must admit that the Sulphate Manufacturers' Association has justified its existence), surely there is room for some combined action in respect to this most important matter of our future coal supply.

Any combination formed with a view of beating down profits and wages below a fair and reasonable rate, would be an iniquitous thing; but under the present circumstances of exorbitant prices and uncertain supply, combined action is not only perfectly justifiable, but urgently called for. Attention might first be directed to the possibilities of future supplies of coal on fair terms. If, on inquiry, it should turn out that there is no remedy for the present state of affairs, then investigation should be pushed in two directions. The first is the possibility of obtaining coal supplies from our colonies, or from foreign countries; and the second, the encouragement and development of means of dispensing with coal—such as those generally known as oil-gas and water-gas processes. Some of our Associations would do well to take the question in hand.

Looking at the magnitude of the interests involved, I have been surprised that this question has not excited more public attention amongst gas interests; but the silence may be accounted for in two ways. No one believed that the dispute would be maintained for so long a period; and we have all been looking, week by week, for a satisfactory settlement. Another reason is that many other industries are in much the same position as gas companies, of being compelled to hand over more than their total earnings for the aggrandisement of coal speculators. Some are able to cease working altogether, and thus avoid losing money; but that is a very dubious advantage. Possibly therefore the combination above hinted at might be extended to include all users of coal. The interference of legislative or other influence with private enterprise, is only to be resorted to in extreme cases; and the state of the coal trade has already reached that stage. So it will be well

for gas undertakings to see what can be done, before depleting their reserve funds, or straining relations with their customers by raising the price of gas. Nor would such outside pressure be altogether a new thing, for surely the regular supply of coal at fair prices is a matter of as much importance in regard to the well-being of the public, as gas or water supply, and many other things that now come under government regulation.

TECHNICAL INDEXING.

By Alex. M'I. Cleland, of Liverpool.

When the members of the Incorporated Gas Institute received their copies of the "Transactions" for the current year, and discovered that they contained a "Subject-Matter Index," they naturally rejoiced that, at length, there were signs that a much-neglected branch of technical literature was about to be dealt with in a proper manner. Possibly there were regrets that the Publication Committees of 1892-3 and 1893-4 had not been able to labour in a wider field, and embrace in their index the "Transactions" of societies other than The Gas Institute; but thanks, no doubt, were inwardly awarded to the Committees for what they had already done, and hopes expressed that their future efforts would be on a more liberal scale. A technical index, even if its boundaries be somewhat narrow, is one of the greatest boons to modern scientific inquirers—economizing time, reducing labour, and often preventing useless repetitive work. None consulted the few pages at the end of the "Transactions" for 1893 with more implicit trust than the writer, who hoped to find in them many short cuts to knowledge, royal roads to information, concerning matters connected with the manufacture of gas. Alas! for human confidence. The guides were untrustworthy; the roads misleading.

Without hesitation, it will be granted that, whatever an index, great or small, ought or ought not to be, it certainly should be accurate. It may fall short of what its editors desire; its scope may not be wide enough; but its accuracy must be beyond all question. Unfortunately, the first index for which the Publication Committees have made themselves responsible is sadly wanting in this primary and most essential characteristic. Take a few instances, out of many, of want of accuracy: Under the heading "Administration of Gas-Works," appears a paper which, the index says, ought to be found in the "Transactions" for 1880, but which the writer cannot find in his copy. The same remark applies to one of the papers scheduled under "Hydraulic Main;" and under the same heading Mr. D. Ford Goddard is credited with a recent paper which was, as a matter of fact, prepared and delivered by Mr. C. Gandon. After "Rules," a note in brackets tells us to "See also Gas Balance," though it is difficult to see the connection. Again, in no less than four places are papers referred to the right years, but to the wrong pages of the "Transactions" of those years.

Lest, however, the charge of hypercriticism should be brought against the writer, and in answer to a possible demurrer that he is visiting the sins of the printer upon the heads of the Committee and its courteous Chairman, note the following: Under "Ammonia" is scheduled a paper on the "Manufacture of Sulphuric Acid;" and among the curious jumble covered by "Coals," we discover a paper giving an account of an early attempt at carbonizing by means of inclined retorts. Under "Condensation" appears a paper which is, in reality, a description of a new form of anti-dip and tar-arrester. Again, we find the unfortunate printer (if he be the guilty party) has occasionally transposed the dates of papers, as, for instance, in dealing with "Gas-Engines." But the want of accuracy is not the only fault, though the most serious one, to be brought against this index. Its full title is "A Subject-Matter Index of the Communications," &c., read before the "Gas Institute from 1865 to 1893, inclusive, compiled by the Publication Committees 1892-3 and 1893-4," and guaranteed by the name of a Chairman who is certainly not unknown in the gas world. Now, a subject-matter index of the "Transactions" of any society is understood to be an index in which papers, &c., are arranged, not merely according to their dates, or titles, or names, but one in which each paper, communication, or note, has been examined in detail, and scheduled possibly under three or four headings.

It is but fair to state that the above sketch of an indeal index has been partially carried out by the Publication Committee, but in far too minor a degree, considering that the work is the outcome of the efforts of a quartette of gentlemen for a period of over twelve months. The process of subdivision has not been carried nearly far enough. Take one or two instances: We find only four papers under the heading of "Coke." As a matter of fact, this list should also include three papers which are scheduled under "Residuals." Again, "Management" could justly claim one of the papers which appears under "Coals," and two which are found under "Exhausters." Take again the decidedly "up-to-date" subject of "Water Gas." Surely the meagre list of two papers under this heading might legitimately be extended so as to include one from "Gas-Engines," and a couple at least from "Carburetting Gas."

Some of the headings also are far too generic—as, for instance, the heterogeneous collection of geology, mining, calorimetry, storeage, carbonization, finance, &c., &c., for which "Coals" is responsible. The same objection applies to the greater subject of "Purification." Are not the papers grouped under this heading worthy of greater subdivision than has been meted out to them?

But if subdivision is meagre in many cases, it is altogether lacking in one important branch. Under "Inaugural Addresses," we find a bald list of names, dates, pages, and nothing more. Now these addresses frequently contain the very cream—the pith and marrow—of the experience and refined thought of some of the most eminent men in the profession. Occasionally an address is nothing more than a *résumé* of the work and progress of the past year; but more often than not the President-Elect allows the light of his intelligence to play upon one particular subject, and places on record information the value of which can hardly be over-estimated. Take only a couple of examples: The address of Mr. Denny Lane for the current year is a most thoughtful inquiry into the comparative cost of generating light from coal gas and electricity, and one that will be appealed to for some years to come. Why not schedule this under "Combustion of Gas" and "Electricity and Gas"? Again, Mr. W. A. Valon's address of 1892 contains much valuable information on "oxygen," "oil gas," and "labour," and is worthy of being referred to in the index under the corresponding headings.

But, it may be asked, why attack in such detail matter contained in a poor sixteen or seventeen pages? Certainly not from any animosity towards the Publication Committee, who deserve sincerest thanks for their efforts, which, it must always be remembered, are purely voluntary. The severe criticism contained in the previous sentences is prompted entirely by the conviction that the index under review is but a tentative one, and will be followed by a much larger and more comprehensive work at some later date. Therefore it is necessary to nip youthful errors in the bud, lest they should increase, and grow too large to be dealt with in age.

Year by year the need of a thorough system of technical indexing is becoming more and more pressing. It is felt on all sides that the increasing bulk of technical literature is growing more and more unwieldy. Just glance for a moment at the periodicals, &c., devoted mainly, or in part, to the interests of gas manufacture. England has five, France seven, Germany four, America three, Austria three. Add to these the eleven societies all directly connected with gas manufacture and engineering, with which our own country is blest—not to mention those of other countries; and we see at once what a stupendous task the original investigator has before him when he wishes to ascertain what has already been accomplished in the line of his particular inquiry.

It may still further be argued that a good weekly periodical, such as the JOURNAL OF GAS LIGHTING, always reports whatever of interest takes place in the gas world. This is perfectly correct, so far as it goes; but very frequently considerations of space deter even the JOURNAL from reporting in full; and, besides, none but those who have tried it know the weary labour of plodding through two or three ponderous volumes in search of matter the whereabouts of which a well-compiled index would indicate at once.

A brave attempt was made by Mr. W. R. Chester, in his recently published "Bibliography of Coal Gas," to meet, in some degree, the want of a suitable index. But his work, being that of one man, and possibly involving a financial loss, is necessarily incomplete, and already calls for a revised and supplemented edition. The problem is not one that can be attacked by a private individual. Bodies of individuals with ample funds at their disposal—societies such as The Gas Institute or the Institution of Gas Engineers (may they soon be united, if only to avoid confusion of title)—are the only means through which the much-needed reform can come.

Meanwhile, until it is possible to purchase, at the cost of a guinea, or even a couple of guineas, a thoroughly reliable "Subject-Matter Index," or "Bibliography," of all matters connected, directly or indirectly, with gas manufacture or engineering, individual workers must be content to compile their own "index," and make it as complete as time and opportunity will permit. This has been the writer's plan for some years past. But it is a plan that is full of defects—partly due to want of leisure, partly to risk of error, and partly to the personal element that enters so largely into such "home-made" indexes.

In conclusion, the writer begs to express a hope that the foregoing remarks may lead Publication Committees of the Gas Institute or other kindred societies, to combine their efforts, and speedily produce an index which shall embrace the threefold characteristics of accuracy, clearness, and conciseness. The cost might be great, and the profits *nil*. But the gas profession at large would be the gainers; and an example would be set which other, and widely differing, societies would not be slow to follow, with the result that in a few years scientific inquirers would be able, by laying their hands on their bookshelves, to ascertain, in a few moments, the exact state of the literary pulse of any subject under investigation.

Alderman F.N. Haywood, the newly-elected Mayor of Accrington, was for many years a Director of the Accrington Gas and Water Company, and recently Vice-Chairman.

TECHNICAL RECORD.

THE PEEBLES OIL-GAS PLANT AT ST. HELENS.

Amid the present records of trouble in many Midland and Northern gas-works, caused through the disastrous coal strike, it is pleasant to hear of any new and successful methods being adopted to keep up a regular supply of gas, and to maintain the illuminating power.

Mr. S. Glover, the Engineer and Manager of the St. Helens Corporation Gas-Works, has for some time been experimenting with cheap fuels, and enrichment by means of tar and oil; and, after a careful study of all the processes in the market, he decided upon erecting a Peebles oil-gas plant. The bulk of the gas is made from the cheapest qualities of coals, carbonized in the usual way by means of Ω-shaped retorts, heated by generator furnaces, and charged and drawn by means of West's manual machines. Care is taken to select coals which will produce a large volume of gas, and a saleable coke. Good heats are maintained in the settings, so as to ensure the charges being thoroughly burned off, as the illuminating power of the coal gas is now quite a secondary consideration. The enrichment of the gas thus produced, up to the desired illuminating power, is entirely carried out by means of oil gas made on the Peebles process (Messrs. Young and Bell's patents), now owned by the Oil-Gas Enrichment Company, of Edinburgh.

The new plant at St. Helens consists of four settings of three iron retorts (though only two settings, or six retorts, are at present required. The whole of the four settings can, however, be heated from one generator furnace. After the hydraulic main, which is charged with oil, comes the condenser, scrubber, purifier, meter, sampling holders, and testing-room. The method of conducting the heating gas and secondary air to and from the settings is on an entirely new plan, devised by Messrs. Young and Glover; and it is answering the purpose in a most admirable manner, at a very small cost.

Oil gas at the rate of 4 to 6 per cent., according to the quality of the coal gas, is added at the inlet to the station meters; and no difficulty has been experienced in getting the gases to mix properly. The illuminating power is easily controlled; and this, along with the saving in cost for enriching, and the simplicity of the whole process, are among the many advantages claimed for it. In addition to the large make of gas per ton of oil, there is recovered from the retorts a small quantity of coke, of very good quality, which finds a ready sale at a high price.

The new plant was formally inspected by the Corporation Gas Committee on Wednesday last, and general satisfaction was expressed at the complete way in which the work had been carried out, and with the quality of the gas as supplied to the town since the oil plant has been started. The Committee considered that, as the estimated economies by the adoption of the Peebles process are now guaranteed, it would not be necessary for the price of gas to be raised to meet the extra cost of providing coals during the recent strike.

THE DEVELOPMENT AND TRANSMISSION OF POWER FROM CENTRAL STATIONS.

The concluding lecture delivered by Professor UNWIN on the above subject at the Society of Arts (see *ante*, pp. 762, 803, 848, 891) was devoted to a comparison of gas and electricity as media for the distribution of power.

Dealing first with gas, the lecturer pointed out that nothing new or untried is involved in its distribution for power purposes. It has, he said, one distinctive advantage over compressed air or electricity—viz., that the manufacture is carried on continuously through the 24 hours; the fluctuations of demand being met by storeage, which is neither difficult nor expensive. There is no reason to think that the cost of ordinary lighting gas is so high as to preclude its use on a considerable scale for power purposes. Taking the price at from 2s. to 3s. per 1000 cubic feet, and the consumption of a gas-engine, on an ordinarily varying load, at 26½ cubic feet per hour per horse power, the cost of the power for gas, exclusive of interest on the gas-engine, comes to £8 to £12 per horse power per year of 3000 working hours. But the cost at which lighting gas is sold includes interest on a vast network of mains and the loss due to leakage over an extensive area. This part of the cost is not fairly chargeable against gas used for power purposes. In an installation for the supply of power, the system of mains would be far simpler than in a distribution for lighting. With comparatively few consumers taking relatively large quantities of gas at a steady rate throughout the year, all the interest and depreciation charges would be smaller than those incurred in a distribution of illuminating gas to a multitude of comparatively small consumers. It appears that the cost of the manufacture of coal gas, including coal, wages, and petty stores, is about 10d. per 1000 cubic feet. Probably 8d. more, making a total of 18d., would allow sufficient margin for profit and cost of distribution to power consumers in a manufacturing quarter not unfavourably distant from the generating works. But at that figure, the cost of the power would be only £6 per effective horse power per annum. The charge for interest and depreciation on the motor plant and for wages would not add to this more than £3; making the total cost to the consumer £9 per effective horse power per annum.

The central electric lighting station at Dessau, where the motive power is produced from gas-engines worked with lighting gas, has been sufficiently successful to show that such a method of obtaining power is commercially possible.* In an electric station gas-engines have the advantage that they can be started and stopped when required, and have no stand-by losses like those of steam-boilers. At Dessau, a large accumulator battery is used for storing energy when the engines supply in excess of the demand, and restoring it in hours of small demand. The efficiency of the battery on the average of the year is 79 per cent. About 52 per cent. of the whole supply passes through the battery; so that the waste of current due to the battery is about 11 per cent. of the total yearly supply. The average gas consumption of the motors is 26½ cubic feet per effective horse-power-hour. Motors of varying power were adopted, with an idea that they would best meet a varying demand. The constructors of the station now think that the accumulator battery renders this unnecessary, and that motors of a larger and uniform size would be more economical. They claim, as advantages of a gas plant compared with a steam plant, that less space and less water are required; that there is absence of smoke, and no danger of explosion; and that gas stations can be distributed more easily over the area to be supplied.

The lecturer next described briefly the system of distributing natural gas for heating and power purposes at Pittsburgh. He then passed on to deal with other supplies of gas which could, he said, be furnished at a cheaper rate than ordinary illuminating gas—*i.e.*, water gas, Dowson gas, and a mixture of lighting gas of low power and producer gas proposed by Mr. B. H. Thwaite—and gave the following figures showing the density and calorific value of various gases:—

—	Cubic Feet per Pound.	Calorific Value in Thermal Units.		Oxygen required for Combustion per Cub. Ft.	Oxygen required for Combustion per Pound.
		Per Cub. Ft.	Per Pound.	Cub. Ft.	Lbs.
Manchester gas	..	..	..	1·229	..
American gas	26·50	616	16,326	1·320	..
London gas	33·70	617	20,801	1·157	3·48
Do.	30·30	633	19,199	1·240	3·35
Pittsburgh gas	24·75	833	20,610	1·480	3·27
Dowson gas	14·89	160	..	0·240	0·32
Water gas, uncarburetted	26·00	284	7,373	..	..
Water gas, carburetted	20·80	640	13,317	..	..
Petroleum	..	..	20,363	..	3·35

The next matter dealt with was the flow of gas in pipes. Having quoted formulæ for lighting and Dowson gas respectively, the lecturer adduced the following figures, to show the power that can be transmitted by these agents to a distance of 5000 feet, with an initial velocity of 45 feet per second:—

Kind of Gas.	Diameter of Main, in Inches.	Initial Absolute Pressure, in Pounds per Square Inch.	Difference of Pressure Producing Flow, in Inches of Water.	Quantity of Gas, in Cubic Feet per Hour.	Horse Power Transmitted.
Lighting	6	15·59	24·6	31,800	1,200
	12	15·12	14·4	127,200	4,190
	24	14·00	5·5	509,000	19,210
	36	14·84	3·9	1,145,000	43,200
Dowson	6	16·70	55·4	31,800	353
	12	15·64	26·0	127,000	1,413
	24	15·15	12·4	509,000	5,655
	36	15·00	8·3	1,145,000	12,722

Professor Unwin passed on to consider the subject of the electrical transmission of power, the practicability and probable commercial importance of which had, he said, been indicated by the late Sir William Siemens in 1877, in the course of his address to the Iron and Steel Institute. Later, in 1883, he delivered a lecture on the subject at the Institution of Civil Engineers. At that time he was not able to describe, as practically working transmissions, much more than the Lichterfelde and Portrush railways. Two years ago, Mr. Gisbert Kapp gave before the Society of Arts some interesting lectures on the electric transmission of power; but he described only a single case of any magnitude then in operation—viz., the installation at Schaffhausen, where about 500-horse power was being electrically transmitted across the river. Since then, however, the striking Frankfort-Lauffen experiment has been carried out, and power transmitted successfully, and without more than about 25 per cent. loss, a distance of 108 miles. The lecturer then went on to say:

No doubt electrical transmission of power to great distances is possible by more than one method. It is a condition in such a case that a very high tension—20,000 to 40,000 volts or more—should be used, or the cost is excessive. That such currents will be used seems likely; but this can hardly yet be reckoned as accomplished, at least, on a large scale, and with commercial

* Professor Unwin gave a few particulars in regard to this installation, which has been fully described in the JOURNAL. (See Vol. LIX., pp. 21, 67.)

success. In a great deal that has been said about the electrical distribution of power, one thing has been forgotten. It is, that there have always been means of transmitting power to considerable distances; and if such transmissions are rare, it is not because they would fail mechanically, but because the cost of transmission is too great for profitable application of the power. Motive power was transmitted four miles by compressed air in 1861, before electric transmission was thought of. If electrical transmission is to play an important part, it will only be when it can be carried out so cheaply that the power can be supplied to consumers at a lower rate than they can manufacture it for themselves.

In the distribution of electrical energy from central stations for lighting purposes, a great deal has already been accomplished. Financially, electric lighting operations appear also to be succeeding, though it is too early to estimate the measure of their success. But a higher price will be paid for energy for lighting than for energy required for power. In towns like Geneva, where electricity can be generated by cheap water power, and where gas costs 7s. per 1000 cubic feet, the success of electric lighting is assured. In other cases, the great convenience of the electric light will no doubt counterbalance some excess of cost when compared with other means of lighting. In another case, which is strictly a case of power distribution from a central station, electrical engineers have achieved a remarkable success. In the United States there are now some 4000 or 5000 miles of electric tramways, which are working with complete mechanical success. A case where electricity is likely to be used very successfully in transmitting motive power is in working traffic on underground and overhead railways.

For both lighting purposes and traction, a high price can be paid for power. But when it is distributed for industrial purposes, the question of cost is much more important; and the progress of electrical methods of distribution has been much less rapid. Every electric lighting company would be glad to supply power, if only to increase the day load, and so to reduce the idle time of the machines; and in very few cases is power taken from electric-lighting mains. Mr. Shoolbred has stated that in Bradford a few electric motors for hoists, lathes, and other purposes have been fixed; but at 6d. per unit the cost per effective horse power is £60 per annum (3000 hours). At that rate the power can hardly be used, except for occasionally worked or intermittent machines. Even if electricity were sold for power purposes at half the price charged for lighting, the cost of the power would be greater than that of steam or gas power.

Very probably, in future, alternating currents will replace continuous currents for distant transmissions. It has been decided to use alternating currents, simple or of two phases, for the transmission from Niagara to Buffalo. Alternating-current dynamos are free from some of the insulation difficulties which have to be encountered in continuous-current machines, and can be worked probably at tensions impossible for the latter. If motors for alternating currents can be made simple and self-starting, like continuous-current motors, then the facility of transforming the voltage of the current in a purely statical transformer is an advantage which will give alternating currents a superiority in long-distance transmissions. But here, again, the cost of transformers is a not unimportant factor in determining the feasibility of a transmission. Probably it is only where water power is available, and in most cases only where cheap overhead transmission is possible, that electricity can be supplied at a cost permitting it to compete with other sources of power.

The rest of the lecture was devoted to a description of various installations for electrical transmission of power.

Resignation of the Water Engineer of Nottingham.—The water engineership of Nottingham has become vacant by the resignation of Mr. L. T. Godfrey Evans, who has commenced private practice as a consulting engineer, and to advise upon, and carry out, schemes of water supply, drainage, and sewerage, with offices in Brougham Chambers, Nottingham.

The Covered Service Reservoirs of Naples.—In the course of a paper on "Covered Service Reservoirs," read by Mr. S. Tomlinson, M.Inst.C.E., before the American Water-Works Association, he gave an interesting account of the reservoirs for the city of Naples, which are constructed inside the Capedimonte Hill; they are, in fact, 150 feet below the surface of the ground. This admirable situation was adopted because the hill had already been honeycombed for building stone, and the galleries left by the old miners could be enlarged without great expense. The low-service reservoir consists of five ovoid galleries, excavated parallel to each other. They measure 35·4 feet high and 30·3 feet wide. The depth of water is 26 feet. Three of the galleries are 830 feet long, while the other two are 666 feet long; and the total capacity of the reservoir is 211 million gallons. Up to 5 inches above the top water-line, the sides of the excavation were plastered with cement, varying in thickness from 2 inches at the bottom to 1½ inches at the top. The plaster consists of two layers, the under one of which is composed of two parts of *puzzuolana* and one part each of sand and lime. The finishing coat is of sand and cement in equal proportions. The basins are ventilated by shafts sunk from the surface, the entrances to which are covered and secured. The great depth below ground level at which these reservoirs are situated ensures that the water supply is maintained at an equable temperature of about 55° Fahr. all the year round.

GAS-ENGINES IN THE UNITED STATES.

A Paper read by Mr. F. H. Shelton before the American Gaslight Association at Chicago, October, 1893.

Regarding the subject of this paper, I have two convictions—first, that gas-engines do not occupy the position they intrinsically should, as gas-consuming appliances; and, secondly, that this Association should have some sort of convenient memoranda of the engines that have appeared upon the market, which memoranda decidedly has not heretofore existed. Hence, what I am endeavouring to do in the paper herewith offered to you is, first, to show some figures that will make us realize what a small relative field gas-engines occupy, hoping that my comments and your discussion will induce some correction of whatever faults now exist; and, secondly, to give a brief description and illustration of every make of gas-engine that has commercially appeared in the United States market.

Let me first make my path somewhat clearer by stating these further points: I am not going into the history of gas-engines in general. I refer those who care to coach up on such to the scant literature existing upon the subject. In the United States I find almost nothing. There seems to have been no original thought on gas-engines evolved on this side of the water. There are no American books or treatises. The only "native" articles in the gas journals worth noting are graduating theses, by Mr. Albert Spies and by Messrs. E. Kidwell and E. R. Keller, giving a detail of "Otto" tests. The balance of our gas journal gas-engine literature is made up of scattered copied foreign articles, and thinly disguised makers' advertisements. An illustrated historical "report," even by the Franklin Institute, of Philadelphia—an American institution to the core—is upon a foreign make. At present there is a series of articles upon "Modern Gas and Oil Engines," by Mr. Albert Spies, appearing in *Cassier's Magazine;* but it is practically only a running description of miscellaneous typical domestic and foreign makes. No system of classification is followed; nor is any complete enumeration of either foreign or domestic forms professed or given. Even the gas man has written upon the matter perhaps more meagrely than upon any other subject. The New England and Ohio Associations have never had a gas-engine paper. The Western has but one (by Mr. E. H. Jenkins, in 1891), which was more especially a comparison of gas with steam for one particular application. In short, the only paper on the general subject that I can find in all our Associations is one by Mr. G. Ramsdell, 13 years ago before this Association. If you wish to read up on gas-engines, you will find, as far as I know, nothing of American origin beyond the above and a few Franklin Institute articles published in its *Journal.* Practically you will have to turn to the English works. The best are: "The Theory of the Gas-Engine" and "The Gas-Engine, its History and Practical Working," by Dugald Clerk; "Gas-Engines," by W. Macgregor, 1885; and "Gas and Petroleum Engines," by W. Robinson, 1890. Also "King's Treatise on Coal Gas."

I am not going into the theory of the gas-engine, nor its proper design. On this standpoint, those interested will find in the above books that theory also is expounded to one's heart's content. I am not discussing Canadian engines. I have no knowledge of what has or has not been done, or of what forms have appeared "across the line." I am not discussing essentially oil or petroleum engines, such as the Brayton or Priestman, which, though blending imperceptibly into gas-engines, are yet of no special commercial interest to sellers of gas. I am not claiming particular wisdom upon the subject of gas-engines. I have only a general interest and knowledge concerning them. If the makers of gas-engines, who are best informed upon the subject, will not join our Associations, nor give us knowledge or papers upon their wares, we must get these ourselves as best we can; and they cannot then well object if they are incorrect. I am only offering you some gathered information and opinions; regretting, for this reason at least, that, not being in the gas-engine business proper, I cannot cover the subject as well as it might be covered.

I am not, nor is the Company with which I am connected, in any way, directly or indirectly, commercially interested in the manufacture of, or in promoting any make of gas-engine whatever. Hence whatever I may say—however correct or incorrect it may be as to fact or conclusion—it is at least done in sincerity, and without "an axe to grind." Further, as this is purely a personal paper, no part of it must be construed as the United Gas Improvement Company's views, or as that Company's liking or disliking, indorsement or non-indorsement, of any particular make of engine. In view of the delicate ground that one treads in commenting upon, or in even describing, various makes of any machine, I must insist upon the above point. With an apology for this long preliminary, which has yet seemed to be best, let me get down to my direct subject.

To verify my ideas as to how little gas-engines are used relatively, I sent out a number of circulars asking specific replies to 26 categorical questions relating to the matter. These were addressed to typical men in the business—men who are managers of medium-sized works and upwards in all parts of the country, who, as a whole, know what they are talking about, and represent that hard-working and progressive force in the business. A very gratifying number of replies were received; and I think I am right in taking the figures and ideas so gathered as a fair basis for conclusion. In about

60 cities, ranging from 8000 to 555,000, and aggregating a total of 4,061,000 population, I find in use only 540 engines, or but one to every 7500 people. The percentage of output used by these engines is so small that only 20 of those answering figured it out, or even estimated it. "Too small to calculate," one-tenth, or one-third, or one-half of 1 per cent., were common replies. Most gave figures that ranged between 1 and 3 per cent.; but five were over 3 per cent., and the solitary high one was 16 per cent. The average was but 3 per cent. In view of the fact, however, that more than half of those answering felt that the percentage was inappreciable, or too small to calculate, I personally think that the real average amount of output due to gas-engines is but 1 to 1½ per cent.; and I also think that the 60 cities in question are fairly representative of the matter throughout the country.

There is no doubt whatever that the actual amount of gas used by gas-engines is a very small proportion of our output. The "progressive modern gas man," as he so likes to be styled, pursues burners, governors, stoves, and other details relentlessly. He works up an output for purposes of heating and cooking of 10, 20, and even 50 per cent. of his business; and yet he is content to have gas-engines—mechanically efficient gas-consuming appliances that are thoroughly tried, economical, and satisfactory—responsible for but a paltry fraction of his output. That a better showing can be made, is proved by the results obtained in individual places; but, on the whole, the facts are as I have stated. Now, should this be? Is not something wrong somewhere? Is it going to continue so indefinitely with this unsatisfactory showing?

The trouble may be in four different directions: (1) In the gas-engine as a machine. (2) In the gas-engine not being good compared with other motors. (3) In the makers. (4) In the gas man.

(1) *Do gas-engines, as machines, do their work, and are they all right in themselves?* I think the general opinion is that they are, and that whatever fault exists is not in them. The great majority of replies on the point indicated that no excessive time or attention is requisite on the part of the user, nor other than the ordinary care and attention required than is given to any motor or other machine. Only 5 per cent. thought to the contrary. The repairs were almost unanimously considered as "reasonable," "moderate," and "low"—there being but three dissenters. It was further practically agreed that, if engines have any kind of decent attendance, they rarely call for any special time, attention, or expense on the part of the gas company after the first starting of them, and the understanding of their working on the part of the user. In answer to the general direct question: "Do they, as a rule, give satisfaction to the users?" 96 per cent. unqualifiedly answered "Yes;" some adding "every time," "decidedly," "first class," and like emphasis. The chief dissenter from this general verdict is a man who prides himself on operating also "the finest electric station west of the Mississippi." I think we can feel that, with a fair make of engine and decent attendance, gas-engines will do the work and give satisfaction in 95 cases out of 100; and that whatever fault exists does not lie in the engine as a machine.

(2) *Are other motors superior?* I do not think we need consider water motors as practical competitors that amount to much. In the first place, they are made only in relatively small sizes; secondly, in many towns they are useless, owing to lack of water pressure; thirdly, the growth of the meter system acts against them; fourthly, small powers, where gas might feel their competition, will, in the judgment of the writer, be largely covered by small electric motors. (Note that I say *small* powers; I will explain this later on.) While water-motors are good and cheap in many cases, comparing favourably with other powers in cost both of installing and of operation ($50 to $100 per horse power), yet, for reasons unnecessary to enlarge upon here, their use is, as a matter of fact, limited; and to my mind they are not any great factor in checking the growth of gas-engines. From the replies that I have received on the point, I think this opinion is generally held.

With regard to steam power, in factories with large power, where its surplus is sublet from a countershaft, with no new engine of any sort needed, I find rentals varying from $40 to $100, and a very general rate to be $75 per year per horse power. The average price of gas at 40 points for gas-engine purposes was $1·65 per 1000 cubic feet. Running 300 days at 10 hours, and 20 to 25 feet per hour per horse power, would make a gas horse power cost $100 to $125 per annum. This is more than the cost of this form of steam power; but as a gas-engine in all likelihood would not need to give full power all the time, and hence would save gas in proportion, and as gas will probably be sold (as in many places it is now) for gas-engine purposes at considerably less than $1·65, I think we can assume that these costs per horse power are not far from the same. But as the steam user in this case does not need to invest in any plant, steam will have the preference. The real comparison should be made with a new plant, where either a small steam or a small gas motive-power outfit must be put in complete. The first question, of course, is cost; and here, unfortunately, we are weak. A steam engine and boiler can both, in the majority of cases, be put in for the cost of the gas-engine. And yet despite this I do not fear the steam competition. The desirability of no fire or ashes, no boiler, no danger, no delay in getting up steam pressure, no running water needed, no engineer's licence, less space required, no change of insurance, cleanliness, and other advantages, is so great that, unless a gas-engine costs more than a steam plant, a proper showing will usually secure its installation. The cost of operation of the two varies so greatly, in view of different prices of gas, efficiency of engine used, work done, cost of boiler, coal, &c., that I cannot attempt to go into figures, wherein one could cipher for a week. I can only say that the majority of small steam plants work extravagantly, and require paid attendance. Moreover, the majority of small powers work intermittently. In most cases, with a low gas-rate, gas-engines needing no engineer will be found to be as cheap to operate as steam, and often very much cheaper. It is unquestionably a question of local condition. If a man is about to instal a small power plant, with steam *versus* gas in mind, I think, with the rates for gas which at this date most companies should be willing to make, together with the decided advantage of the gas-engine, that, as a rule, we need not fear that we can get the business. Of course, where a steam plant must go in, in any event—say, for heating—it is different; but, on the whole, and in ordinary cases, I do not think steam competition is the trouble with the gas-engine business.

In electric motors we have the great competitor of the gas-engine. So much is this so that I think we may say in general that it is not water or steam power that we need fear, but our common friend and enemy electricity. The electric motor has as many advantages as the gas-engine. The present cost of installing these motors is less; and the elastic rates for operation have tended to enlarge their use. Their advocates claim as follows: They are compact, can be often placed where a gas-engine cannot, and can be connected or shifted more easily; they require even less attention than a gas-engine, need no water, require no effort to start, give no odour, take up less room, are cleaner, sound better than the exhaust of a gas-engine, are "handier," and are "up to date," "modern," "electric," and all that. This is, in the main, undoubtedly a strong array of good points. Supplemented by the push of the competition from a score of makers, aided by questionably paying rates from the local electric company, they have done a large and growing business, and checked the use of gas-engines. As a rule, they give satisfaction. Now, I grant all this; but to get right down to the bottom of the matter, the real reason for their growth is, to my mind, not that (excepting in the smaller sizes) they are superior to gas-engines, but because of two points—"push," and lower selling prices. It does seem to me that both these points can be met by the gas people, if they want to meet them; and, understanding the real facts better, they will shake off the lethargy and passive acquiescence to a claimed superiority of the electric motor, which, it seems to me, has largely dominated the past.

In the first place, gas-engines, as motors for general small power purposes, are as good, and have fully as many advantages, as electric motors, if we except some few special applications, and very small sizes, such as are used in offices, &c.; I mean comparing sizeable power motors of 3 to 5 horse power and upwards. Gas-engines are compact; they can be installed almost and practically anywhere; they require no boiler, no coal, no ashes, no running water supply, no constant engineer or attendant; and, if of proper design and arrangement, they are as clean and odourless, and as quiet, as an electric motor. Starting need not be, and rarely is, a trouble in small sizes. In larger ones, "self-starters" will cure that defect. In short, there is no reasonable doubt, as shown by the almost universal verdict in the answers received, as already stated, that gas-engines, as a whole, give entire satisfaction. As far as arguments, talk, or facts go, there is no reason, from this standpoint at least, why we should allow electric motors to take the business. In some minor points, these motors are slightly better; but, on the other hand, gas-engines have positive advantages over them. For instance, despite claims to the contrary, the liability to interruption of power-current is distinctly greater than of the gas supply; and it always will be, from the very nature of the high-tension operation of an electric station and its exposed wires, compared with a gas system. I need not enlarge on this. The effort to keep in gas-meters to ensure an electric service is well known to us.

Again, there is a source of danger existing around an electric motor, through currents, wires, and defective or abrading of insulation, that does not accompany a gas-engine. It may be contended that gas is an explosive agent. True; but, as a matter of fact, I cannot learn of a solitary accident from such cause, in the use of gas-engines, that would offset the injury or deaths to the many who have touched, inadvertently, live motor wires. Gas-engines are not decorated with signs reading "Danger," "Hands Off." I do not think that we can excuse lethargy on the ground that motors are generally or essentially better than gas-engines. Come right down to facts, and each one is first class—each has some slight advantages. For small powers, fans, office uses, and handy purposes, I think the electric motor the better; for 3 to 5 horse power and upwards, my choice would be for the gas-engines—the surety of service, reliability, low cost of repairs, and still more the low cost of operation, being prominent reasons therefor. At present the motor leads, I think, not from superior merit, but from wide advertising, from "cutting" rates, from its novelty, and from being "electric."

But how of the future? To my mind it rests on our adequately covering the two points that have given electric motors their present position—viz., push and selling prices. The former rests with each individual gas man. I firmly believe that whether 1 to 5 or 15 to 20 per cent. (according to the town) of one's output may be used for gas-engines depends on how the business is locally handled. As to cost, here is the knotty problem. Electric motors are relatively cheaper to make; for they have practically but one rotary movement. A gas-engine has that, and a reciprocating and crank action, several minor ones, and twice as much weight of metal. Hence it is not unnatural that their price should average a great deal more than that of electric motors. How are we to meet this? First, by a considerably lower price for gas-engines than has prevailed heretofore. (This, I think, will come; and I take it up under the next heading.) Secondly, by showing that, excepting with cutting, and hence unstable rates, the actual cost of operation is not cheaper with electric motors, as is claimed, than with gas-engines. For instance, I am advised that the prevailing schedule rate for contract intermittent electric powers in the New York, Boston, and New England territory is $120 to $60 per horse power per annum for from 1 to 10 horse power and upwards. A gas-engine, consuming at the rate of 20 to 25 cubic feet per hour, on $1·65 gas (an average), running full time, 3000 hours yearly, would only equal $100 to $125. It will be readily seen that, with similar intermittent work, the gas consumption, and hence the cost of operation would fall quite in the range of the electric costs; and that, with gas at $1, it would undoubtedly average cheaper. Moreover, using gas as measured costs only for the power used. The majority of electric motors are not on meter system, but on contract rates, whether or not power is used. There is no chance of the customer saving. Of course, the meter system may grow; but what is its essence? It is the getting on a paying basis, the measuring and selling by measure; and the usual result is an increase of cost to electric users in such a change. Of course, the great trouble, which no theory or schedule meets, is that of "cut" rates. If money is to be lost, however, it is better to let the other fellow lose it. Special rates for day service, to utilize one's plant in the daytime, are often quoted. They can as consistently and as desirably, or as undesirably, be made by gas companies for engines and day power purposes. It is a matter of judgment.

As a rule, I believe that, if an electric company is charging paying rates, a gas-engine can be operated for less money, power for power, be the more reliable, and cost less for repairs. Many answers received support this belief; and the tendency also towards the raising of electric rates from old contract figures is dwelt upon, and is pertinent to the question of which will be the cheaper power. Getting the business will not be done by sitting still. Work only will do it. Both systems are here to stay; and to my mind those who put out the most energy will get the best of the returns.

The tendency of gas is towards fuel and mechanical purposes. I think that special rates for these, to each special business, can be made to advantage to an extent greater than in the past. With gas at $1 to $1·25 per 1000 cubic feet, good engines at a lower price than heretofore, and the gas man as everlastingly sticking to it as the electric people, I distinctly and firmly believe that gas-engines can be made to get their half of the business.

(*To be continued.*)

Death of Mr. G. Deighton, of Harrogate.—We regret to record the death, on the 7th inst., of Mr. George Deighton, the Works Superintendent of the Harrogate Gas Company. The deceased was born at Harrogate in 1824; and he first became connected with the Company in 1857 or 1858. He at first worked as an ordinary stoker, and then assisted in main-laying and outdoor work. On the position of superintendent becoming vacant in 1860, he was induced to undertake the duties; and these he discharged ably and faithfully up to the time of his death. Mr. Deighton leaves a widow, four daughters, and three sons. Two of the latter—Mr. William Deighton and Mr. George Deighton—are in the Company's service at the present time; the former superintending the distribution department, and the latter assisting in the works.

M. Bandsept's System of Smokeless Combustion.—In the JOURNAL for May 9 last (p. 827), we described the process devised by M. Bandsept, of Brussels, for utilizing the heat of gas in the transmutation of the surface of metals. The inventor explained his system to the members of the Belgian Gas Association in a paper he read at their meeting at Liége in the following month; and his remarks excited considerable curiosity. We have received from the author a print of his paper, which deals fully with the question of the production and rational utilization of the intense heat of gas. M. Bandsept claims to have discovered a method of smokeless combustion which will have an important bearing upon the future of the gas industry. The smoke nuisance is the dread, and its abolition the dream, of most dwellers in towns; and any definite step in the direction of realizing this dream deserves recognition. Without discussing here the merits of M. Bandsept's process, we may say that sufficient interest has been shown in it in Brussels to lead to the formation of a Company to work it.

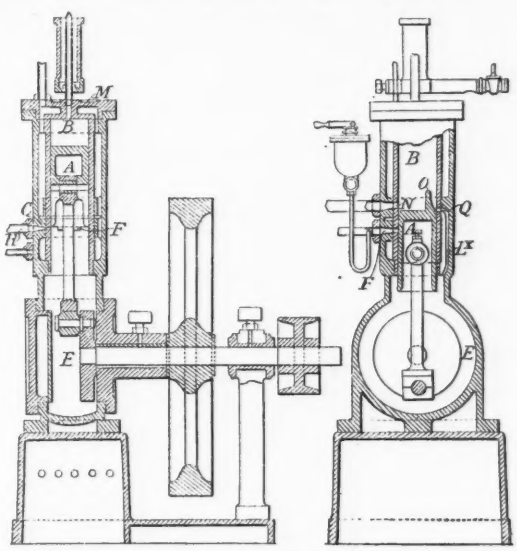
REGISTER OF PATENTS.

Gas-Engines.—Cock, F. W. C., of Bathwick, near Bath. No. 18,513; Oct. 15, 1892.

This invention refers to gas-engines so constructed that the crank works in a closed chamber or casing (the explosive mixture being slightly compressed in this chamber), in which an impulse is obtained at each revolution—such as is referred to in patent No. 6410, of 1891; or an engine in which the piston during its forward stroke compresses the charge within the cylinder at the forward end, corresponding to the closed chamber or casing aforesaid—such as patent No. 9247, of 1891.

In these patents, the air and gas forming the charge are drawn into the compression chamber or casing through ports furnished with valves in the chamber or casing; the valves being opened through the external pressure of the air and gas being superior to the pressure that is inside.

In the present arrangement of engine, the inlet-ports are moved from the chamber itself, and placed in the cylinder, so as to be covered by the piston throughout the entire revolution of the crank-shaft, except for an extremely brief period, when the piston is close to the end of its return stroke. By this arrangement, the piston itself forms the covering valve for the inlet-ports, and defines the period and duration of the admission. This ensures that a more uniform charge shall be admitted, and that the volume shall be more positively determined than was possible in the former arrangement.



The first figure is a sectional elevation of the engine, with the piston at the top of its stroke (assuming the engine to be vertical); the second, an end elevation, partly in section, with the piston shown at the bottom of the stroke.

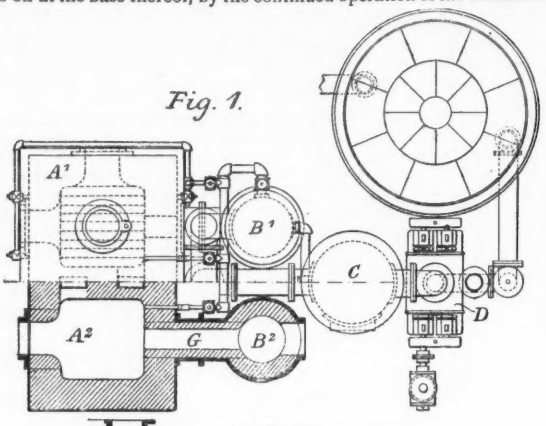
The admission of gas and air is shown as through two separate ports; the air being admitted by the port F, while the gas is admitted by the port G. These ports are of considerable width, but of little depth; so that the duration of their opening will be brief, as they will be closed, except when the piston A is at or near the extreme of its return stroke. The flow of the gas and air, or of the explosive mixture, may be controlled by any suitable device. In the case of a horizontal engine of the kind described in patent No. 9247 of 1891, the gas and air, or the explosive mixture, passes into the end of the cylinder which corresponds to the chamber E of the example shown in these illustrations.

The following is a description of the mode of working of this engine: Assuming the piston A to be at the top, as in fig. 1, the air and gas ports are uncovered, and in free communication with the chamber E, in which at this time a partially vacuous condition exists. The air and gas thereupon rush in, to satisfy this vacuous condition. At this moment, also, the explosive mixture is in a compressed state above the piston, and is driven into the igniting-tube M, placed in the top cover of the cylinder B, which ignites it in the usual manner, producing the downward or "power" stroke. Almost immediately after the commencement of this downward stroke, the gas and air ports are closed by the descent of the piston, which then begins to slightly compress the gas and air mixture drawn into the chamber E below it. By the time the piston has completed its downward stroke, as in fig. 2, it has uncovered the outlet-port N; thus allowing the products of combustion to escape. It has also uncovered the upper mouth Q of the passage L—forming the communication between the chamber E and the upper side of the piston. The products of combustion have, as regards the bulk of them, escaped through the exhaust, by reason of their pressure above the external atmosphere; and, so soon as this escape has lowered the pressure to the condition prevailing in the chamber E, the mixture passes into the upper part of the cylinder, coming in contact with the shield or deflector O, which is carried on the top of the piston. This deflector prevents the passage of the mixture across the top of the piston, and so out by the outlet-port; and it compels it to rise to the top of the cylinder, passing away from the exhaust-port, and enabling it to sweep round and chase before it the small portion of the products of combustion remaining in the cylinder. By this time the piston has so far advanced in its upward stroke as to cover the mouth of the exhaust Q. During the ascent of the piston, it will be seen that the before-mentioned partially vacuous condition in the chamber E below it is produced.

Gas-Producing Plant.—Newton, H. E.; communicated from R. N. Oakman, of Greenfield, Mass., U.S.A. No. 22,174; Dec. 3, 1892.

This invention relates to a method of manufacturing gas by "heating two bodies of fuel in separate chambers to incandescence, by draughts of air drawn downward into the fuel through the open tops of the chambers, and by drawing off the gaseous products by an exhauster at the base of the chambers, to be stored for subsequent use; then shutting off the air, and admitting steam, which is decomposed by its passage up through one body of incandescent fuel, drawing the resulting impure gases and vapours therefrom, and down through the other body of incandescent fuel, and drawing the resulting fixed and purified gas off at the base thereof, by the continued operation of the exhauster."

Fig. 1.



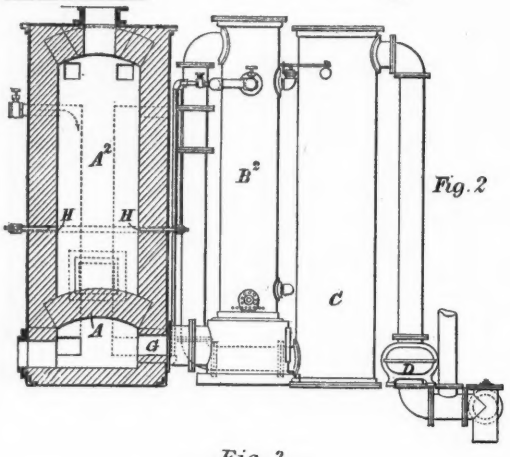


Fig. 2

Fig 3.

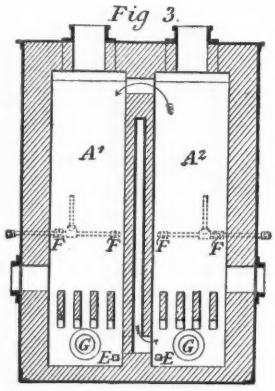


Fig. 1 is a plan of the plant, with one generator and cooler in section. Fig. 2 is a side elevation, with a generator in section. Fig. 3 is a transverse sectional elevation of the two generators.

A^1 A^2 represent the generators, which may be enclosed in one shell, and have an opening at top. The generators are separated by a partition wall, in which are openings at top, connecting the two generators, and passages, connecting each generator at bottom, below the grate, with the external air. B^1 B^2 are coolers, connected at bottom, by means of a tube or passage G, with the generators below the grates. These, which act to cool down the gases passing away from the generators, act also as boilers to produce the steam for working an engine, and for making water gas. Each cooler is connected at top, by a pipe common to both, with the bottom of a washer C; and the washer is connected at top with an exhauster D, by which the various gases produced are forced to separate holders for subsequent use. The various connections throughout the plant are provided with valves. E are steam-inlets to the generators below the grate; and F are steam-inlets in the fire-box above the grate.

In operating the plant, the doors at the top of the generators A^1 A^2 are both left open; the generators being charged with fuel, and ignited. The valves between the generators and coolers are open; and, the exhauster being started, air is drawn down through both fuel-beds, until the coal is well ignited and brought to incandescence. Both valves to the air-inlets are closed. After the coal has been brought to incandescence, the top doors are closed; and the valve to the cooler B^1 is also closed. Steam is admitted to the bottom of the generator A^1 at E, and is drawn up through the fuel-bed into A^2, and down through the bed therein—the resultant water gas being drawn away through the cooler B^2, to the washer, exhauster, and holder. When the fuel-beds are cooled down, the valve to the cooler B^1 is opened; the top doors are opened; and the coal is blasted again to the proper temperature, by drawing the air down through it. The valve of the cooler B^2 is now closed; steam is admitted at the bottom of the generator A^2 at E; drawn up through A^2; down through A^1 and the cooler B^1 to the washer, exhauster, and holder, as before—the operation being reversed from time to time.

If producer gas only is wanted, then, after blasting up both fuel-beds, by taking air in at the top, the top doors are closed; the valve to the cooler B^1 is shut; the air-valve is opened; and steam is admitted into the bottom of A^1 at G—a small quantity of steam and very little air. This will allow a longer run before reversing. After a suitable time, the air-valve is closed; the valve to the cooler B^1 is opened; the top doors opened, to blast up again; and steam is shut off from the bottom of A^1. The top doors are opened to admit of a down-draught of air, to blast up the fuel; and the run of water gas is made the other way—the top doors being closed, and air and steam being admitted into the bottom of A^2.

In this way, says the patentee, an excellent quality of water gas and producer gas can be made, and the fuel-bed kept in good condition.

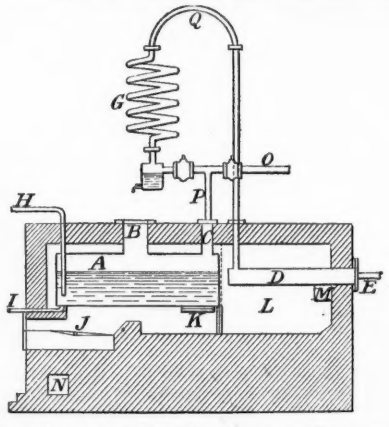
Pipe-Joints.—Holmes, T., and Williams, R., of Seacombe, Cheshire. No. 23,354; Dec. 19, 1892.

This pipe-joint or coupling consists of flanges provided on their jointing faces with annular corrugations—the ridges or projecting rings of the one flange fitting within the annular grooves or recesses of the other, so that a perfectly tight, sound, and durable joint can be made by using only red lead or equivalent plastic packing material between the flanges—that is, without any solid or rigid material, in cases where high-pressure steam, gas, or other fluid is being conveyed by the pipes.

Manufacture of Illuminating Gas from Mineral Oils.—Laing, J., of Newington, Edinburgh. No. 35; Jan. 2, 1893.

This invention relates to "the breaking-down of oil vapours into permanent gas for illuminating and other purposes, by passing the oil vapours from a still charged with oil through a superheater, in such a way that only the lighter gases formed from the oil will pass into the superheater, and there be converted into permanent gas. By this means less heat will be required to be supplied to the superheater than if all the gases which left the still were immediately rushed through the superheater; and the surplus heat from the still should be sufficient to decompose these lighter vapours into permanent gas."

In order to bring about this end, the patentee proposes to make the pipes connecting the still with the superheater of such a length, and keep them at such a temperature, as will condense the heavier gases, and allow the resulting oil to return to the still. Should water be present with the oil in the still, it would be vaporized, and, condensing before reaching the superheater, it would return to the still and suddenly burst into steam, which might prove dangerous. There is therefore a trap arranged outside the still to catch this water, and so prevent its re-entering the still. As the vapours which pass from the still come in contact with the radiant heat in the superheater, they are decomposed into permanent gas suitable for illuminating purposes. The still is charged with a quantity of oil consistent with the quantity of gas desired to be made; and, instead of distilling to dryness, and thus producing coke, which is very harmful to the plant, says the patentee, he prefers to leave such a consistency of bottom which on being run off will form a pitch of good quality when cooled. According to the nature of the oil employed, the gas produced may be passed through scrubbers or purifiers, or it may be passed direct to the holder. Where it may be desirable to convert only a portion of the oil into gas, and to break down the remaining portion into lighter oils, by arranging suitable fittings the superheater can be cut off, and the oil vapours passed direct through a condenser, and there converted into oil.



In the illustration, A is the oil-still; B, the manhole; C, the exit for vapours; D, the superheater; E, the gas-exit going to the holders; F, the water-trap; G, the condenser for the heavier vapours; H, the feed-pipe; I, the residue run-off pipe; J, the furnace; K, the dampers; L, the superheater chamber; M, the flue leading to N, which is the flue going to the chimney; O, the connection for the oil-condenser; P, the connection for oil or gas making; and Q, the connection between the gas vapour condenser and the superheater.

Gas Motor Engines.—Abel, C. D.; communicated from the Gas Motoren Fabrik Deutz, of Koeln-Deutz, Germany. No. 735; Jan. 12, 1893.

This invention has for its object the construction of a gas motor engine in such manner that, "while capable of developing considerable power, it shall occupy as small a space as possible in the direction of its width and height, so as to be specially applicable where the space for placing the engine is limited, as in the case of vehicles."

For this purpose, two engines are arranged in line with, and opposite to, each other; both piston-rods being connected to the same crank on the engine-shaft, which also carries a fly-wheel. A countershaft extending along the entire length of the two engines is geared to the engine-shaft by a pair of equal worm-wheels, so as to revolve at the same speed. The countershaft also carries at each end a centrifugal governor, that governs the speed of each engine. The countershaft drives two smaller countershafts by gearing proportioned as two to one; so that the smaller countershafts are made to revolve at half the speed of the engine-shaft. They carry the cams that actuate the levers of the discharge-valves of the two cylinders.

On the first-named countershaft are arranged cams that act upon the levers of the gas-admission valves. These cams are mounted on sleeves that slide on the countershaft, and are connected to (or formed in one with) the sleeves of the centrifugal governors; so that, when the engines run too fast, the governors move the sleeves, in order that the cams may be prevented from acting upon the gas-valve levers during one or more strokes.

The sleeve also has a neck, which is embraced by a forked lever on a shaft that also carries two horizontal lever-arms loaded with weights, and so arranged as to cause the forked lever to press upon the cam sleeve in the contrary direction to that in which the spring of the governor acts. Thus, the governor arms, being relieved of their spring pressure, become very sensitive, and will move the cam out of gear with the gas-valve lever when a comparatively low speed is exceeded.

The loaded levers are, however, connected to a device whereby one or both can be raised; and thus be made to relieve the forked lever partially or wholly of their load, so that the governor spring can act either fully or partially on the governor sleeve. By this means, the governor will act upon the gas-valve cam only when the engine is running at a higher speed than before—such speed being variable, according as one or both levers are raised. When both loaded levers are allowed to act on the governor sleeve, the engine will run at a slow speed; when the one lever is raised, it will run at a medium speed; and when both are raised, it will run at a fast speed.

In order to enable the regulation of both engines to be effected simultaneously from one end of the combined engines, the levers of each engine are connected by chains of unequal length to an overhead drum, on the shaft of which is fixed a pitch-wheel; and the pitch-wheels of the two engines are geared together by a pitch-chain. The one shaft carries a hand-lever, by which it (and consequently the pitch wheels and drums) can be simultaneously turned into three different positions. In the one position, both chains of each engine hang loose, so as to allow both pairs of weighted levers to act upon the governor sleeves; on moving the hand-lever into the second position, the two chains having the least amount of slack will be wound on their drums, and thus raise the two corresponding weighted levers; while on moving the hand-lever into the third position, the other two weighted levers are also raised.

APPLICATIONS FOR LETTERS PATENT.

21,048.—Coe, F., and Harrison, R. J., "Automatically registering the pressure of gas." Nov. 6.

21,059.—Thompson, W. P., "Gas-heaters." A communication from F. P. Ziegler. Nov. 6.

21,089.—Abel, C. D., "Gas-producers." A communication from the Gas Motoren Fabrik Deutz. Nov. 6.

21,120.—Hamilton, J. H., "Gas motor engines." Nov. 7.

21,123.—Young, W., "Production of illuminating gas, benzol, and other products from liquid hydrocarbons." Nov. 7.

21,155.—Olsen, J. L. W., "Heating ovens by gas." Nov. 7.

21,190.—Bel, J. E. A., "Water-meters." Nov. 7.

21,240.—Hood, J. J., and Salamon, A. G., "Production of cyanides." Nov. 8.

21,267.—Steuart, C. F. de K., "Gas and oil motor engines." Nov. 8.

21,318.—Boult, A. J., "Gas-governors." A communication from A. Ford. Nov. 9.

21,325.—Ruscoe, J., "Conveyors." Nov. 9.

21,329.—Bibbero, M., "Gas-burners." Nov. 9.

21,331.—Skene, R., "Gas-governors." Nov. 9.

21,416.—Berry, H., "Valves applicable to water, steam, air, or gas." Nov. 10.

21,485.—Gray, J., "Retorts for distilling shale or oil-yielding minerals." Nov. 11.

Embezzlement by a Water-Works Cashier.—Yesterday week, Edward Reddish, chief clerk and cashier in the Water Department of the Warrington Corporation, was charged before the Magistrates with embezzling £80, the money of the Corporation. Prisoner, it was stated, was for 17 years in the service of the Water Company, and since 1883 had filled the position of cashier. The water-works were acquired by the Corporation in 1891; one of the conditions of the purchase being that the officials of the Company should be kept in the employ of the Corporation for two years. Since the purchase, prisoner's salary had been increased from £143 to £156. The two years expired in October last; and the Town Clerk remarked that, by a strange fatality, the prisoner's defalcations were discovered and he was suspended on the first day that he came under the independent control of the Corporation. It was stated that there was no falsification of the books; and the Corporation did not press the case. On behalf of the prisoner, it was stated that he began to take money some 18 months ago to meet a heavy doctor's bill, for which he was pressed. His wife and other members of his family had been ill; and the money had been used to meet the extra expense from this cause. The prisoner was sentenced to one month's imprisonment, with hard labour.

LEGAL INTELLIGENCE.

SUPREME COURT OF JUDICATURE—COURT OF APPEAL.

Thursday, Nov. 16.

(*Before Lords Justices* Lindley, Smith, *and* Davey.)

Hill v. Wallasey Local Board—Laying Mains in a Private Road.

This was an appeal by the defendants in form from the judgment of Mr. Justice Romer, but really from the decision of Mr. Justice Kekewich, who, on an interlocutory motion, restrained them from disturbing the soil of the plaintiff's private road. The case afterwards came on for trial before Mr. Justice Romer, who, without going into the facts, declined to interfere with the view taken by Mr. Justice Kekewich on the question of law, and gave judgment for the plaintiff. The point in dispute was as to the right of the Local Board to lay water-pipes, without the consent of the plaintiff, in a part of Sea View Road, which he claimed to be his private road; and Counsel for the appellants were content to argue the appeal on the assumption that there was no public right of way over the point in question, though a portion of the road was admittedly public. By a Private Act of 1858, incorporating the Water-Works Clauses Act, 1847, the Local Board were under an obligation to supply water to their district; and cases were cited to show that the private road had been decided to be a "street" within the meaning of the Public Health Act, 1875, the 54th section of which, they contended, authorized them to do that of which Mr. Hill complained. They, however, did not now assert the right to interfere without paying compensation. On behalf of the plaintiff, it was argued that the private portion of the road was not intended to be a "street" within the meaning of the Act, and that, since Mr. Hill had taken it, he had done nothing to alter its character.

Mr. Cozens Hardy, Q.C., and Mr. Cann appeared for the appellants; the respondents being represented by Mr. R. Neville, Q.C., and Mr. M'Conkey.

It was held (Lord Justice Smith dissenting) that the appeal must be allowed, with costs, and that the action ought to be dismissed, with costs, except so far as the costs had been increased by the Local Board asserting the road to be a public highway, which were to be paid by the Board.

Huddersfield Corporation Gas Supply.—In the statement of results obtained at the Huddersfield Corporation Gas-Works during the last financial year, compared with 1891-92 (as given in the Journal last week, p. 901), the figures in regard to the amount of coal and cannel used were accidentally reversed. They should have been: 1891-92—Coal, 16,417 tons; cannel, 32,184 tons. 1892-93—Coal, 31,706 tons; cannel, 19,864 tons. In other words, during the past year, 12,320 tons less cannel were used than during 1891-92; while the average quality of the gas supplied has, we learn, been increased by 2 candles.

Ilkley Gas Company.—The final meeting of this Company was held in Leeds last Thursday. Mr. T. J. Critchley presided; and he gave a *résumé* of the proceedings which culminated in the sale of the undertaking to the Ilkley Local Board. A statement of affairs presented by the Secretary showed that the sum of £55,000 was received as purchase-money, and to this had to be added £9738, the balance of revenue and other accounts realized, less £6326 dividend balance on capital and opposition costs in obtaining the Bill; making (with £1082 revenue) the total amount to be divided £59,494. Of this sum the Directors had agreed to give their late Manager £1750. The shareholders decided to place £500 at the disposal of the Directors, out of which they are to pay certain compensation to the servants of the Company. It was also decided that the balance available for distribution should be divided among the shareholders in the proportion of £36 2s. 3d. for each original share, and £28 7s. 6d. for each new share. Thanks were given to the Board for their management of the affairs of the Company, and for their conduct of the negotiations with the Local Board.

Local Authorities and their Contracts.—A correspondent writes as follows on the above subject: "According to Major-General Crozier (whose experience as a Local Government Board Inspector, has been sufficiently varied to enable him to form an accurate and unbiassed judgment), the abolition of the 'middleman' in the person of the contractor is by no means an unmixed blessing. It is the particular boast of Messrs. John Burns and Co. that the London County Council have undertaken large works without inviting tenders or making contracts; and it is claimed that this system is advantageous alike to the ratepayer and to the workman. Major-General Crozier disputes the accuracy of this contention—at least as regards the ratepayers. During the inquiry which he recently held at Wigan, respecting an application for additional borrowing powers for the extension of the Corporation gas-works [see *ante*, p. 904], he made some strong remarks about the manner in which the accounts were presented. In several instances additional sums were asked for on account of extensions, the cost of which, when a similar inquiry was held twelve months ago, was put down at specific sums. The explanations which were forthcoming were not very clear; and the Inspector expressed in plain terms his belief that the system of carrying out public works by engaging men and buying material always led to trouble and confusion. A member of the Corporation had the courage to say that he agreed with the Inspector; but he confessed that Trades Unions were too strong for the Town Council to resist. The remarks of the Inspector, no less than the admission which they led up to, are worthy of very serious consideration. In the manufacturing towns of the North, the trades unionists have forced the Local Authorities to insert provisions in their contracts intended to secure the payment of wages which the unionists declare to be fair. In a few towns, as in Wigan, they have gone further, and have persuaded the Corporations to practically abolish the contractor. But these steps have been taken in nearly every case against the opinion and advice of the older and more experienced members of the local bodies. They are admittedly intended solely to benefit the men who are employed in carrying out public works. Whether they do this may be a moot question; but that they are to the positive disadvantage of all other members of the community, including the rest of the working men, can admit of very little doubt."

MISCELLANEOUS NEWS.

THE LONDON COUNTY COUNCIL AND THE METROPOLITAN WATER SUPPLY.

At the Meeting of the London County Council last Tuesday, the Water Committee presented an important report on the subject of the water supply of the Metropolis. It set forth that, when the Committee first had the report of the Royal Commission under consideration, they requested their Chairman (Mr. A. Bassett Hopkins) to prepare a memorandum on the present position of the Council in relation to the question of the water supply. He complied with the request, and presented to the Committee a paper dealing with the various points to which he thought attention should be directed. This document they had ordered to be sent to the members of the Council—reserving their own observations upon it for the present. They then reported as follows: "The Metropolis Water Act, 1892, gave power, *inter alia*, to the Council to prepare and introduce Bills relating to the water supply; but, pending the investigations of the Royal Commission, we thought it prudent to suspend action under these provisions. The Royal Commission having now completed their work and issued their report, it appears to us plain that some arrangements must be made without delay for the provision of an additional water supply; and that the Council should be in a position to acquire such areas or lands as may be found to be necessary for the supply of water to the Metropolis. Parliamentary powers will be required for this purpose; and these should, in our opinion, in the first instance, be of a general character—specific and detailed plans being left for subsequent preparation and submission to the Council. The desired object may probably most conveniently be effected by an amendment of the Water Act of 1892, or by a separate Bill to enable the Council to purchase land and water rights by agreement, for the purpose of supplying water to the Metropolis. We therefore recommend—'That the Council do resolve that it is desirable for the Council to obtain powers for the acquisition of such areas as may be needed for the supply of water to the Metropolis; and that, accordingly, the Parliamentary Committee be instructed to publish the necessary notices, and to prepare a Bill for that purpose.'"

Mr. Bassett Hopkins moved that the report be received.

Mr. Benn, on behalf of the General Purposes Committee, suggested the addition, after the word "Metropolis," of the words "together with power of supply." He said the Committee ventured to think this would make the recommendation more complete.

Mr. Bassett Hopkins acquiesced.

Colonel Hughes, M.P., asked if it was competent for the Council to take the initiative, in regard to something which must be most expensive, without having estimates. He said it was quite possible they might wish to acquire land and water rights in North Wales or Kent; but he did not think any power had been given to the Parliamentary Committee to introduce a Bill to enable the Council to become purchasers of areas to furnish water. Was this matter to go through without the usual fortnight's notice, and be put in the vague way in which it was now presented, so that members did not know what they were voting about? It seemed to him like sending up fire-balloons to see how the wind blew.

Mr. Bassett Hopkins said he did not regard the matter as one of those which came under the rule as to the fortnight's notice.

Colonel Hughes pointed out that the proposal of the Committee might involve an expenditure of £500,000; and surely, he said, notice ought to be given of the discussion of such a question. He thought the report should have been made earlier.

The Chairman (Mr. J. Hutton) remarked that the proposition did not pledge the Council to any definite expenditure, but merely referred the matter to the Parliamentary Committee; and therefore no notice was needed.

Lord Farrer said they were all very much in the dark as to where new supplies of water were to come from. There were suggestions in the report of the Water Commission as to localities where water could be obtained and storeage reservoirs constructed. It might happen that during next session the Water Companies would come forward to acquire some of those areas; and the Council should be beforehand in making themselves masters of any new sources of supply. The resolution did not pledge the Council to purchase anything.

Dr. Longstaff characterized the report as one of the most extraordinary ever presented. He said the Council could only obtain powers by specifying the areas it was proposed to acquire. Did the present recommendation mean that they were to acquire Wales or the Thames Valley?

Mr. Bassett Hopkins explained that it was brought forward in pursuance of the Water Act of 1892, which empowered the Council to promote Bills relating to water supply. It was impossible to bring up a report before, because it was provided that nothing should be done by the Council until the report of the Royal Commission, which was then sitting, was published. That report had only lately appeared; and there had been barely time for the Water Committee to thoroughly digest all the proposals contained therein. The Council need be under no apprehension as to their credit being pledged without the members being fully consulted beforehand. The Bill would be brought up for consideration; and there would be ample time for discussing it before the Council were pledged to a single penny of expenditure. The Committee proposed making the application as general as possible. The powers in the Act of last year were of this character; and if they gave authority to the Council to introduce Bills in the most general form relating to the water supply of the Metropolis, this fact might be fairly taken as an acknowledgment on the part of Parliament of the principle that the Council were essentially interested in the question. But it required no such assurance from Parliament as that given last year, because the Select Committee which dealt with the Water Bills expressly stated in their special report, that in their opinion the authority for supplying water to the Metropolis should be vested in the London County Council. From the report of the Royal Commissioners, it could be seen how necessary it was that the Council should have the powers sought. Without going into details respecting the terms of the report, it was apparent that there was an absolute necessity for some provision being made for augmenting the water supply of London. The quantity consumed in 1891 averaged about 182 million gallons per day; but on the present year it had risen to upwards of 200 million gallons, of which a little more than 40 million gallons were obtained from wells in the chalk and from springs. The remainder was drawn principally from the Thames and the Lea. The Water Companies had parliamentary power to take water from the Thames up to 130 million gallons per day; or, rather, they claimed that, for strictly speaking they had a right to only 110 million gallons. However, he was willing to give them credit up to the higher quantity. From the Lea there was an indefinite power of withdrawal—of course, restricted to the capacity of the river. The Companies had already gone to their utmost limit; and it was thus perfectly clear that, from some quarter or other, application must be made for increasing the supply. The Council had already defined their policy in this matter. On the 13th of October, 1891, the Council passed certain resolutions after very careful consideration. On that occasion, Lord Farrer, in one of the ablest speeches ever delivered on the subject in the Council, dealt with all the considerations affecting this important question. The Council then expressed their readiness, so far as their powers enabled them to do so, to undertake the duties and obligations conferred upon them by the Select Committee of the House of Commons when they indicated them as the Water Authority for the Metropolis. They could not, however, accept the stipulation contained in the Committee's report, that, as a condition precedent, the Water Companies' undertakings were to be bought up at what was considered to be a fair and reasonable price; but they expressed their willingness to purchase, provided a fair basis of value could be found. It was only consistent, in carrying out that policy, to bring forward a proposal such as the one now before the Council. He therefore urged the necessity for adopting the Committee's recommendation.

Mr. Lloyd remarked that he hoped the Council would set to work to discover other sources of supply.

Alderman Fletcher Moulton said he strongly advised the Council to take the step suggested. They had just had the report of the Royal Commission; and, whether they liked it or not, that report had practically changed the position of the question of the London Water Supply. They must not go to sleep for a whole year, unless they were prepared to find the most favourable positions taken up by those who differed from them. Thus there was need for promptitude. Then the question arose as to the practicability of what was proposed. Undoubtedly, it was practicable. Under the Public Health Act, urban sanitary authorities had the power, subject, no doubt, to certain hampering conditions, to acquire land for the purpose of water supply; and the Council could apply to be put in at least as favourable a position as these authorities. This showed that it was practicable to promote a Bill which would secure for the Council an important increase of their powers with reference to water. If it was practicable, the question remained as to its wisdom. It was no secret that the Water Companies were going to bring forward Bills based on the report of the Royal Commission; and when the Council knew this, he thought it would be a grave omission of duty—he would not say negligence—if they at the same time did not put forth requests for new powers in the name of the people of London. Unless they were content to come in a year late, they must at once give the necessary parliamentary notices.

Colonel Ford submitted, as an amendment, that it should be an instruction to the Parliamentary Committee to consider and report as to the desirability of inserting a clause in the Bill empowering the Council, if it was deemed necessary, to provide capital for those Water Companies who in future might apply to Parliament for power to increase their capital.

Mr. Thornton briefly seconded the amendment.

Mr. Westacott disagreed with the proposals of the Committee; saying he believed that, if their policy were embarked upon, it would be one of the most disastrous ever undertaken. The Council were going to Parliament with a Bill, without the slightest prospect of success. Practically, they proposed to shunt the report of the Royal Commission, and to ignore the existence of the Water Companies. Where was the new supply coming from, and how were they going to deliver the water? He most strongly protested against the Committee's proposals, which would end in a waste of £20,000 of the ratepayers' money.

Mr. Benn said it was quite an error to suppose that the Committee ignored the report of the Royal Commission. Without some such protection as was offered by the recommendation, they would, in the course of a session or two, see various Companies coming along and seizing the very best water-bearing areas.

The amendment was then put and lost; and the Committee's recommendation was thereupon adopted with Mr. Benn's addition.

In pursuance of the recommendation contained in the Water Committee's report, the following notice was published yesterday in one of the London daily papers: "The London County Council (in this notice called 'the Council') intend to apply to Parliament in the ensuing session for leave to bring in a Bill for the purposes or some of the purposes hereinafter mentioned—viz.: To enable the Council (with a view to the future supply of water to London and the neighbourhood), to purchase by agreement, or take on lease, any lands, houses, and buildings or easements, and also any water-works, wells, waters, or rights to take, or convey, or sell water, and any rights, powers, and privileges of any Company formed for obtaining or supplying water which they may think it desirable to purchase or take on lease with the object aforesaid. To empower the Council to hold and manage any such lands, to exercise any such rights and powers, and from time to time to let such lands, works, or rights, or any of them, on lease or otherwise, and to sell or exchange any of such lands. To enable the Council, upon any lands purchased or taken by them as aforesaid, to do all such things as may be necessary for carrying into effect the powers to be conferred on the Council by the intended Act. To enable the Council to contract with

any person or persons, corporation, or company as to the giving a supply of water or obtaining a supply of water. To enable the Council to sell and supply water for public and private purposes within the Administrative County of London and the neighbourhood thereof. To amend and extend any of the provisions of the London Water Act, 1892."

The following is the text of the Memorandum already referred to:—

In view of the publication of the report of the Royal Commission on the Water Supply of the Metropolis, the Committee have asked me to furnish some notes on the present position of the Council, as represented in the first instance by the Committee, on the general question, and also on the alternative lines of action for the immediate future, between which the Council may have to choose. It is no part of my duty here to criticize the report, or to call in question any of the conclusions or suggestions contained in it. On the contrary, I understand that I am to take the report, so far as it goes, as a basis for consideration. But to confine our attention exclusively to it, to leave out of account the essential branches of the subject with which it avowedly does not deal, would obviously render any observations on the question of policy so partial as to be useless.

I cannot too strongly emphasize this point of the comparative narrowness of scope of the inquiry which has just been completed. People who do not carefully keep in view the exact reference to the Royal Commission are apt to regard their report as the outcome of an all-embracing investigation of the general subject. Such an idea may produce very mischievous consequences, and may grievously hamper the Council in any action which it may desire to take; and it is absolutely necessary that the Council and the public should have pointed out to them, as plainly and as frequently as may be needed, how far that notion is from the fact. The Committee are, of course, aware of this; but I will venture to remind them shortly of the departments of inquiry which are left untouched by the Commission.

The duty of the Commissioners, in brief, was to find out whether the present sources of supply are adequate in quantity and quality; and, if not, whether such supply can be obtained without going outside the watersheds of the Thames and Lea. To these questions they have given answers more or less definite. They find that the water, as at present supplied, is of a very high standard of excellence and of purity; and they anticipate that it can continue to be used without danger, provided that there is adequate storeage and efficient filtration. As to quantity, they show that a very large addition to the present powers of supply of the Companies will be needed, in order to meet the requirements of the next 40 years; but they find that the means of satisfying those requirements exist within the watersheds of the Thames and Lea, and can be made available by means of storeage reservoirs, increased abstraction of water from the rivers, and the sinking of wells in the chalk. They add certain important recommendations for the prevention of pollution of the rivers, and for ensuring proper filtration of water after abstraction.

It is at once clear that, even within the limits of the report itself, there are some points of great moment that require to be dealt with before the County Council can form a comprehensive policy. To begin with, the reference to the Commission contained no limitation as to the period of time to be considered in connection with the future supply of the Metropolis, and no instruction on the subject; and the Commissioners have restricted their forecast to a term of 40 years. This is, after all, but a short period in the history of a vast and ever-growing population; and the Council may reasonably feel anything but safe in confining their attention to its needs. If we assume the adoption and carrying out of the suggestion of the Commission, the capacity for supply of the Thames and Lea watersheds may be expected to have reached, or nearly reached, their limit about the year 1931. It will then be impossible to further delay having recourse to some outside source. Upon this point the report is silent. The suggestion, I suppose, is that is the concern of the future generation. But when we consider that the various gathering-grounds of the country are already being rapidly taken possession of by other municipalities, that already several of the very best of these grounds have gone elsewhere, and others are likely to follow them—the provincial towns, moreover, making provision for a far longer period than 40 years—we cannot ignore the danger that our successors (including vast numbers of persons already living) may possibly in 1931 find no adequate and suitable source of additional supply left for them, unless perhaps under difficulties, and a cost fearfully out of proportion to what would have to be incurred now. A further subject which the Commissioners did not regard as falling within their province is that of cost. While they view with favour the proposed system of storeage reservoirs of Messrs. Hunter and Fraser, they did not investigate or offer any opinion on the estimates submitted by those gentlemen. A thorough inquiry into, and checking of, those estimates would probably be a matter of considerable difficulty; but it is plainly a condition precedent to the carrying out of the scheme.

The most important subjects outside the scope of the Commission, but forming indispensable elements of a water policy, are these:—

(1) *Sources of Supply Outside the Watersheds of the Thames and Lea; their respective Nature, Situation, and Capacities, and the Practicability and Probable Cost of bringing their Product to London.*—On this subject the Committee and the Council are already in possession of a large body of information, the result of previous parliamentary and other inquiries; and it is fair to say that this information is as much a part of the general question, and as much at the disposal of the Council, as that which has been elicited by the last Commission.

(2) *The Legal Position, Powers, and Duties of the Water Companies.*—There are many legal questions of great public importance which present features of difficulty and doubt; and no policy of a reformed system of water supply would be satisfactory which left these questions unsettled. For example, the claim of the Companies to drain gravel beds adjacent to the rivers, in addition to taking their full statutory quantity from the river direct (this, it will be remembered, is remarked upon adversely by the Commissioners, but, of course, theirs is not a judicial decision); their claim to sink wells without limit on land bought by them, and the supposed authority for this claim is the decision in the cases of *Chasemore v. Richards* and *Acton v. Blundell*; their various and differing claims as to charges in matters of detail, such as baths, high service, &c.; their obligations as to supply both in quantity and quality, and so on.

(3) *The True Value of the Properties of the Companies, and the Just Basis upon which any Purchase, in Whole or in Part, should rest.*—This question derives special importance from the peculiar character of the Companies' Acts in relation to their dividends and charges to consumers, and from published facts of their financial history. Nor should it be forgotten that the estimate of their value, made in 1879, for the purpose of Lord Cross's scheme, turns out to have been far in excess of that shown by their actual profits since that date. A further element for consideration, and a large and difficult one, is the question of the present condition of the Companies' works and plant, and the possibility and expense of adapting it to whatever extended system of supply may be projected.

(4) *The Great Question of the Future Water Authority for the Metropolis.*—Seeing, then, that all these vital points are outside the report of the Commission, it is obviously out of the question to regard that report as presenting anything like an exhaustive guide for the Council as to its policy; and the tendency, which is certain to show itself, to leave out of view those parts of the subject that are not to be found in the report, will require the constant vigilance of the Committee to correct it. Until the whole field has been well surveyed and examined, it is difficult to see how any sound general project can be formulated.

It is necessary, however, at once to consider the course to be pursued at the present moment. As one consequence of the Commissioners' report, it may be expected that Parliament will be immediately asked by the Companies, or by some of them, for extended powers. Several of them have already practically reached the limit of their means of supply with their present works and resources; and others may seek enlargement in order to forestall external interference. This points to a large increase in the capital of the Companies, and also in their power as established undertakings, and in the cost of any possible future purchase. The paramount necessity, however, of acceding to any well-grounded demand for augmented supply may make such a demand irresistible; and in this case the policy of the Council is, while not opposing the demand within the strict limits of what is required, to prevent its being accompanied by the inconveniences just referred to. Several courses occur to me as possible; but there may be others which do not present themselves to my mind. Or a combination of these proposals may be made.

First, the Council, as far as it agrees to the raising of fresh capital, will probably insist on the more recent precedents being followed of its all being issued *bonâ fide* to the public, and of all premium money being placed to a sinking fund, unless some should be made to go to reduce charges to consumers. This, however, the Companies will doubtless agree to as now inevitable; indeed, some provision of this kind will, in all probability, be inserted in their Bills.

Secondly, the Council may ask that it should itself furnish any additional capital to the Companies, either by way of loan or in consideration of shares, or otherwise, or power of supervision or of representation on the directorate might be sought. Advantage could be taken of any new Bills to seek powers for the Council to carry out the recommendations of the Royal Commission as to the inspection of filters, &c.

Thirdly, a "purchase clause" might be inserted on the analogy of the Tramways Act; and perhaps this might be extended to the present undertakings of the Companies, as well as to the new works.

Fourthly, the Council may ask that it should directly undertake any new works, and be the owner thereof—*e.g.*, reservoirs, wells, &c.—supplying to the Companies any additional water they may require on terms and conditions to be settled. There would be little difficulty in raising the money for this purpose; and in carrying it out the ratepayers would obtain a share of the profits, and the Council would gain experience on a small but increasing scale of the management of a water supply.

There has arisen, however, since the appointment of the Royal Commission, and independently of it, an entirely new factor in the problem, and one that may prove a source of grave embarrassment in the carrying out of new works of the kind indicated in the report. I refer to the Thames Conservancy provisions of the Council's General Powers Act of this session. Those provisions, as everyone knows, give to the London County Council and to the Councils of four other counties representation on the Thames Conservancy Board. But they go farther than this. They direct (not merely empower) that Board to bring in a Bill in the session of 1894 to amend the constitution and powers of the Board; and should they fail to bring in a Bill, or should it fail to pass into law, then the London County Council is empowered to introduce, in 1895 or 1896, a measure for the same purposes. It is easy to see here a possible ground of serious conflict and difficulty. No comprehensive scheme of reform of the powers of the Conservancy Board can well omit the question of the relations between that Board and the Water Companies, or any other bodies empowered to take large quantities of water from the river. The present Board appear to assume an indefinite authority to allow the Companies, by a contract and for a money payment, to abstract water. This question should be settled. And, obversely, any new or added powers of abstraction given to the Companies directly by Parliament would, *pro tanto*, narrow the field of possible jurisdiction of the reformed Conservancy Board. If more water is to be taken, is it to be paid for, and to whom, and what is to be the amount of the payment? The Conservancy scheme must necessarily provide, among other things, for the ways and means of carrying out its extended functions; its present revenues being altogether insufficient even for its existing duties and obligations. But precautions are needed (should it be decided to levy more money from the Water Companies) to prevent the incidence of the burden from coming upon the water consumers. Many other circumstances of possible conflict will suggest themselves. So that if, in the session of 1894, we have on the one hand a Public Bill, or a series of Bills for the reform of the Conservancy Board, and on the other a crop of Private Bills from the Companies asking for extended powers of supply from the Thames, the ingenuity of Parliament may be very severely taxed to evolve a result in which the

public interest will be the main interest, or even to avoid incongruity and inconsistency.

It remains to add a few words on the great question of the future Metropolitan Water Authority. This is now ripe for specific consideration; and there appears no reason for further delaying it. It was the leading feature in the Bills of 1891 and 1892; and it was to aid in its settlement that the London Water Act of 1892 was obtained. The Committee purposely deferred action under this Act (except the collection of statistical and other material) until the Royal Commission should report. They have reported; but, as has been seen, they do not touch this part of the subject. Many alternative plans have at different times been suggested; but the progress of discussion and the growth of the idea of some form of municipalization have winnowed these down to very few. The project of amalgamation of the existing Companies may be left out of consideration. It was well discussed and deliberately rejected by the Council on the 13th of October, 1891. The idea of an independent Water Trust has been put forward in various forms. But, as far as I know, no plan has been evolved for rendering such a body directly representative, and all Bills of the kind have hitherto failed to satisfy the Committees of Parliament who have examined them. The Select Committee of 1891 gave a general approval to the principle of the London County Council itself becoming the Water Authority. This, however, was accompanied by the condition that the Council should be required to purchase the undertakings of the eight Water Companies—a condition which the Council declined to accept. Lastly, the Bill promoted in 1892 jointly by the Council and the Corporation of the City proposed a Statutory Committee of the Council, of whom, however, one-eighth should be appointed by the Corporation. This scheme also fell through, not on its merits, but chiefly by reason of the desirability of awaiting the completion of the inquiries of the Royal Commission, and the preparation of other materials for arriving at a decision. If the Committee will refer to the minutes of the Council of the 13th of October, 1891, they will see how far the Council has expressed its corporate opinion on this question. That opinion (which has never varied during the history of the Council) may be fairly taken, I think, to be this:

(1) That the present system of supply by private Companies for profit should be put an end to. [It does not necessarily follow from this that all the Companies should be extinguished together.]
(2) That the Metropolitan Water Supply should be transferred to a public authority.
(3) That the London County Council is the proper authority for the purpose. [This does not preclude the possibility of some representation being given to other authorities interested.]
(4) That, while the Council is willing to purchase the Companies' undertakings, it will only do so on "fair and reasonable terms." That the basis of "fair and reasonable terms" should be authoritatively defined and laid down, and should not be a question of Stock Exchange values, past dividends, or the paper accounts of capital paid up or expended, but should depend upon the true value of the respective undertakings, having regard to their powers and liabilities, to the condition of the property, and to its ability, in each case, to supply future wants.

The work at present before the Committee may then be summed up thus:

(*a*) To deal with the report of the Royal Commission. Are the conclusions therein contained as to future supply to be assumed as established and final? If so, or if only partly so, by whom are the new works to be constructed and owned, and the additional supplies distributed? Or is the report to be critically examined, and the justice of its conclusions called in question? Again, inasmuch as the period contemplated by the report extends only to 1931, is it expedient to insist on the consideration of a longer period? Lastly, assuming the correctness of the opinion that a sufficient supply for 40 years *can* be got in the manner pointed out in the report, is it advisable, nevertheless, in the interests of the people of London, to disregard that fact, and to object to the continued use, or extended use, of a river supply? Another question is, whether anything should be done by the Council to carry out the recommendations of the Commissioners as to prevention of pollutions, and as to the treatment of water after abstraction from the rivers.

(*b*) To watch and deal with any Bills that may be promoted by the Water Companies.

(*c*) To watch closely the provisions and progress of the Bill to be promoted by the Thames Conservancy Board; and to read the question of the future constitution and powers of that Board along with the question of the water supply.

(*d*) To complete the pending inquiry into the chalk supplies of the lower Thames basin.

(*e*) To complete, so far as possible, the investigation of the Water Companies' accounts.

(*f*) To prepare a scheme for a Public Water Authority for the Metropolis; dealing at the same time, so far as practicable, with the question of purchase.

The New Water Scheme for Shrewsbury.—At a private meeting of a Committee of the whole Borough Council of Shrewsbury last week, Mr. J. Barker, the Chairman of the Water Committee, explained the proposed scheme for supplying the town with water by gravitation from Church Stretton Hills, which are situate some twelve miles away. In one of the valleys there, it is intended to construct a reservoir to hold a supply for a population of 33,000 for 200 days, and a service reservoir with filter-bed is proposed at Bayston Hill, at a height of 77 feet above the highest part of the town. To carry out the scheme, it may be necessary to borrow £120,000. If the money could be borrowed for seventy years, the practical effect would be an increase of the water-rate from 1s. 1d. to 1s. 6d. in the pound. The water is reported to be of the highest excellence, and the supply ample. It was decided that a meeting of the ratepayers should be convened, when the whole scheme will be explained by Mr. Barker.

THE DISPUTE IN THE COAL TRADE.

A Settlement arrived at.

At the close of the week ending the 11th inst., to which our last record of the progress of the great dispute in the coal trade was brought up, there were very definite indications of a desire to bring the crisis to an end. This desire was further manifested early in the past week; and, as will be seen below, it was attended by very satisfactory results.

The first matter calling for notice is the action taken by the Government with the view of assisting in the settlement of the differences between the contending parties. In the House of Commons on Monday night, Mr. Gladstone made the following remarks just before the rising of the House: "By leave of the House, I wish to say a few words in regard to a subject of great public interest. The attention of Her Majesty's Government has been seriously called to the widespread and disastrous effects produced by the long continuance of the unfortunate dispute in the coal trade, which has now entered on its sixteenth week. It is clear, from information which has reached the Board of Trade, that much misery and suffering are caused, not only to the families of the men directly involved, but also to many thousands of others not engaged in mining, whose employment has been adversely affected by the stoppage. The further prolongation of the dispute cannot fail to aggravate this suffering, especially in view of the approach of winter, when the greatly increased price of fuel is likely to cause distress among the poorer classes throughout the country. Moreover, the Government have little doubt that the effect of the stoppage on industry is rapidly extending and increasing, and that, unless an early settlement is effected, lasting, if not permanent, injury may be done to the trade of the country. The Government have not, up to the present, considered that they could advantageously intervene in a dispute the settlement of which would far more usefully be brought about by the action of those concerned in it than by the good offices of others. But, having regard to the serious state of affairs referred to above, to the national importance of a speedy termination of the dispute, and to the fact that the conference which took place on the 3rd and 4th of November did not result in a settlement, Her Majesty's Government have felt it their duty to make an effort to bring about a resumption of negotiations between the employers and employed, under conditions which they hope may lead to a satisfactory result. I have therefore addressed a duplicate letter on the one side to the employers and on the other side to the miners—that is to say, to their respective organizations. I will not trouble the House by reading the whole of the letter, but I will read the practical part of it: 'It appears to them that advantage might accrue from a further discussion between the parties of the present position of matters under the chairmanship of a member of the Government, who, it is hoped, will not be unacceptable to either side. Lord Rosebery has consented, at the request of his colleagues, to undertake the important duty which such a position involves. I have therefore to invite the [Miners' or Coalowners'] Federation to send representatives to a conference to be held forthwith under his chairmanship. In discharging this duty, it is not proposed that Lord Rosebery should assume the position of an arbitrator or umpire, or himself vote in the proceedings, but that he should confine his action to offering his good offices, in order to assist the parties in arriving between themselves at a friendly settlement of the questions in dispute.' That letter, I believe, Sir, will be in the newspapers to-morrow morning. The matter is of such interest to members of the House, however, that I thought it desirable to let them know without delay; and I trust the circumstances are such as justify the step which has been taken." The letter referred to by the Prime Minister, the whole purport of which was covered by his remarks and the portion quoted, duly appeared the next morning.

The step taken by the Government was received with very warm expressions of thankfulness by the men in the affected districts; and an opinion was generally held among them that the proposed conference would meet under better auspices than the last—the utmost confidence being felt in Lord Rosebery as mediator. The Secretary of the Coalowners' Federation (Mr. T. Ratcliffe Ellis) was officially informed that his Lordship had fixed Friday, the 17th inst., at the Foreign Office, for the meeting; and that he had suggested that each side should send 14 delegates. Mr. Ellis submitted Mr. Gladstone's letter to the Coalowners' Emergency Committee, with the result that he was instructed to accept the invitation of the Government. At a special conference of delegates of the Miners' Federation, held in Manchester, under the presidency of Mr. S. Woods (Mr. Pickard being unable to attend owing to indisposition), Mr. Gladstone's letter was read by Mr. T. Ashton, the Secretary. After some discussion, it was decided to accept the invitation contained in it. Mr. Ashton was instructed to telegraph to this effect to Mr. Gladstone, and say that the representatives were prepared to meet as early as possible. The telegram was to be followed by a written reply. The reports from the districts relative to the owners' proposals at the London joint meetings were laid before the conference. Without exception, they contained resolutions rejecting the proposals. A discussion on the general wages policy of the Federation followed, after which the conference adjourned until the following day. In the House of Commons, the order for resuming the debate (adjourned from the previous Thursday) on Sir A. Rollit's motion for the appointment of a Hybrid Committee to inquire into the causes and consequences of the coal dispute, with the view to the substitution of conciliation and arbitration for strikes and lock-outs, was read and discharged.

On Wednesday morning, the Miners' Federation delegates held their adjourned meeting, and appointed representatives to attend the conference. They included the President (Mr. B. Pickard, M.P.), Vice-President (Mr. S. Woods, M.P.), and Secretary (Mr. T. Ashton); and the others were selected as being specially suitable, from their connection with the districts likely to be most affected, to take part in the deliberations. It was resolved that a conference of the Federation should be held simultaneously with the meeting at the Foreign Office. Mr. Ellis received a communication from Somersetshire to the effect that at the Newbury pit all the men had returned to work at a

15 per cent. reduction, and that a number of colliers had gone back to work at the Kilmersdon and Huish collieries on the same terms. On the London Coal Exchange, business was again brought almost to a standstill, owing to the intervention of the Government; only those who were compelled to do so making purchases. Most of the colliery representatives, however, showed little desire to force sales; the orders already on hand being sufficient to give employment for some days. Buyers had the advantage where transactions were made. With little business doing, those in attendance had ample time for discussing the situation; and the general opinion seemed to be that the coming conference would be as fruitless of good results as the former meetings were, seeing that the men's representatives avowed that no reduction in wages could be sanctioned.

The joint conference of representatives of the Coalowners' and Miners' Federations took place at the Foreign Office on Friday, under the presidency of Lord Rosebery. The masters' representatives were: Lancashire and Cheshire, Messrs. A. Hewlett, J. Knowles, R. Pilkington, and T. Ratcliffe Ellis; Yorkshire, Messrs. A. M. Chambers, J. Devonshire Ellis, D. Davy, and A. Currer Briggs; Derbyshire and Nottingham, Messrs. J. Jackson and Fitzherbert Wright; Cannock Chase, Captain Harrison and Mr. G. P. Bidder, Q.C.; North Wales, Mr. H. Dennis; Gloucestershire and Somersetshire, Mr. J. Batey. The miners' delegates were: Yorkshire, Messrs. Pickard, Cowey, Parrott, and Frith; Lancashire, Messrs. Woods, Aspinwall, Isherwood, and Ashton; Staffordshire, Mr. Edwards; Derbyshire, Messrs. Haslam and Harvey; Cannock Chase, Mr. Stanley; Nottingham, Mr. Bailey; and Somerset, Mr. Whitehouse. After a sitting extending over four hours and a half, it was announced that the following agreement had been arrived at:—

(1) That a Board of Conciliation be constituted forthwith, to last for one year at least, consisting of an equal number of coalowners' and miners' representatives—14 of each. They shall at their first meeting endeavour to elect a chairman from outside; and, should they fail, will ask the Speaker of the House of Commons to nominate one. The chairman to have a casting vote. That the Board, when constituted, shall have power to determine from time to time the rate of wages on and from Feb. 1, 1894. The first meeting to be on Wednesday, Dec. 13, 1893, at the Westminster Palace Hotel.

(2) That the men resume work at once at the old rate of wages until Feb. 1, 1894. It is agreed that all collieries, so far as practicable, be reopened for work forthwith; and that, so far as practicable, no impediment be placed in the way of the return of the men to work.

The agreement was signed on behalf of the Coalowners' Federation by Mr. A. M. Chambers (Chairman) and Mr. T. Ratcliffe Ellis (Secretary); and for the Miners' Federation by Mr. B. Pickard and Mr. T. Ashton, the Chairman and Secretary. Lord Rosebery also signed it as Chairman, and Mr. H. Llewelyn Smith as Secretary of the conference. The Press Association says it appears that, before the result was arrived at, many proposals and counter-proposals were made and discussed. It is stated that one of the propositions put forward by the owners was that the men should return to work at a reduction of 10 per cent. until March, and that after that date the wages should be settled by a Conciliation Board. The miners' representatives declined this, and insisted upon the old rate as the condition of their returning to work; but they were willing to modify their previous terms to the extent of agreeing that any new rate decided by the Board of Conciliation should begin on March 1 instead of April 1. Eventually it was decided, as a compromise, that, in view of being allowed to return to work at the old rate, they would consent to accept a further limitation of the period to Feb. 1; and this was eventually agreed to. When this settlement was well within view, Lord Rosebery suggested that the opportunity might perhaps be a favourable one for deciding upon some figure as the minimum wage. But the coalowners did not accept this suggestion; and the question of the minimum was therefore left, with other points, to be settled by the Board of Conciliation. Mr. Pickard, in spite of his illness, was the principal spokesman for the miners' representatives, who expressed much satisfaction with the way in which he discharged that onerous duty. On the employers' side, the leading spokesmen were Mr. A. M. Chambers and Mr. G. P. Bidder. Delegates on both sides referred in high terms to the impartial conduct of Lord Rosebery. There is telephonic communication between Lord Rosebery's room at the Foreign Office and the Prime Minister's official residence; and one of the first to be informed of the result of the conference was Mr. Gladstone, who through the day had been anxious to know how matters progressed. In the course of an interview at the close of the conference, Mr. Pickard expressed himself gratified at the termination of the dispute, and said the terms were such as should be satisfactory to the men. Just before the rising of the House of Commons, Mr. Mundella announced the result of the conference, and said he was sure the House would rejoice at the termination of the dispute, and at the fact that the Speaker had consented to exercise the powers which had been vested in him, in case he was called upon to act. Telegrams from a number of colliery districts showed that the news of the settlement of the dispute was received with great satisfaction. At Alfreton, hundreds of colliers assembled in the streets, and raised loud cheers. The bells of the parish church were rung during the evening.

A conference of the delegates of the Miners' Federation was held on Saturday at the Westminster Palace Hotel. The terms of the agreement arrived at at the joint conference on the preceding day were unanimously approved. Votes of thanks were accorded to Lord Rosebery and to Mr. Pickard, M.P.; also to the Press and the public for their sympathy and support. The conference was then adjourned, to meet again at Birmingham on the 7th prox., when the question of the construction of the Board of Conciliation will be discussed. There were great rejoicings throughout the mining districts on Saturday at the settlement of the dispute. In the Wigan and St. Helens districts, preparations were in progress at nearly all the collieries for the resumption of work yesterday. Notices were posted at some that the pits would be re-started; but in many cases it was not considered necessary to give notice. Firemen and others were at work preparing the mines for the reception of the men; but it was considered that a week must elapse before all could be at work. The men employed at the Nunnery Colliery, Sheffield, had an interview with Mr. Emerson Bainbridge, the Managing Director of the Company, who, on behalf of the Directors, thanked the men for their peaceful attitude during the conflict, and volunteered to make advances of money to those who were actually in need of it, in order that they might be better enabled to resume their employment. He also offered to provide the families with fuel. At a meeting held subsequently, these offers were received with great heartiness by the men, whom the local leaders congratulated on the result of the dispute. Neither side, it was said, had gained a victory; but the men had maintained their former wages, and this was what they fought for. The conflict had shown to the great railway and gas companies that colliers were a power to be reckoned with; and the hope was expressed that, in new contracts, these companies would take into consideration the miners' living wage.

The long-continued interruption in the regular deliveries of coal to gas-works, owing to the dispute, produced the expected result last week. On Monday night, the holders at the Dukinfield Gas-Works contained only one day's supply of gas; and there was every prospect of the town, containing 20,000 inhabitants, being deprived of this source of illumination on the following night. Needless to say the Gas Committee were making every possible effort to procure supplies. Two or three weeks ago, the Committee bought 600 tons of coal at Birmingham; but out of the last consignment the Manchester, Sheffield, and Lincolnshire Railway Company, over whose line the coal came, took about nine waggons to their Gorton depôt. When seen by a deputation from the Gas Committee, the Company stated that they had power to do this under their Act. On Tuesday the Gas Committee of the Belfast Corporation gave notice that, owing to the impossibility of getting a sufficient supply of coal for the gas-works, they would be compelled to reduce the pressure on the following Thursday. For about 13 weeks no coals have been taken into the works under the ordinary contracts; all supplies having to be specially bought. The expense caused by lack of coal has, however, been somewhat compensated for by an extraordinary run on the stock of coke; an accumulation of 12,000 tons at the commencement of the struggle having been reduced to very small proportions. The availability of this fuel was highly appreciated by the poorer classes of consumers, especially as the Committee did not advance the price. On Wednesday night the town of Clitheroe was thrown into complete darkness, owing to failure of the gas supply through want of coal. The consequence was that all the public buildings, mills, and shops were compulsorily closed. There was absolutely no coal at the gas-works. On the following morning fresh supplies, however, came to hand, and gas making was resumed. Winsford, a Cheshire village, suffered from a similar state of things. On Thursday morning the gas consumers received from the Secretary to the Gas Company a post-card informing them that the supply would be temporarily suspended, owing to the difficulty of obtaining coal. Over and Wharton, other Cheshire villages, were placed in the same predicament.

Our Bolton Correspondent writes: "It need scarcely be said that the news of the settlement of the coal dispute came as a great relief to corporation gas committees in Lancashire, as well as to the private gas companies. Those in charge of these works have been anxious not to get too much coal ahead at the high rates ruling, and at the same time avoid, if possible, any trouble arising from want of gas for illuminating purposes. At Burnley and several other places the local authorities curtailed the public street lighting as much as possible, so as not to exhaust the supply too quickly; and users were invited to be careful in their consumption of the gas. As showing the additional expense entailed upon some gas-works, it may be mentioned that the loss to Corporations like those of Bolton and Burnley has been about £500 a week. The Blackpool Corporation have been in a position to supply coal to the gas-works at Poulton, St. Anne's, and Kirkham, in the neighbourhood of Blackpool; and but for this help these places would have fared badly."

The Great Drought of 1893.—At the meeting of the Royal Meteorological Society, on the 15th inst. Mr. F. J. Brodie read a detailed account of the great drought of the present year, and its attendant meteorological phenomena. This drought, which prevailed over England and the neighbouring parts of the Continent, was exceptional, both as regards severity and duration. It was followed by a showery interval in July, and was succeeded by another spell of fine weather in August and September. It was due, so far as could be seen, to the almost constant prevalence of large anti-cyclonic systems. During the four months there were no fewer than eight such areas over a large portion of the United Kingdom; their aggregate duration extending over 77 days out of 122 recorded. In addition to these, there were several instances in which the southern portions of the kingdom were influenced by anti-cyclones spread over from the Continent. At times the distribution of pressure over our islands became cyclonic; the depressions, in most cases, extending from the northward. But even when this change occurred, the tendency for fine, dry weather was so pronounced that the showers experienced were very local, and exceedingly slight. In one or two cases, definite depressions over the southern counties were unattended by rain or any unsettled appearance of the sky. One of the most important features of the anti-cyclones was the remarkable manner in which they developed from areas of moderate size into huge systems, which frequently embraced the whole of the European Continent. In respect to the rainfall, the peculiar feature was its singularly partial character; the examinations showing that, in nearly every month and every district, the rainfall in some places doubled the quantity in others. Taking the whole period, there was a deficiency in all parts of the kingdom; the only station at which the fall approximated the average being Glencarron, where the percentage reached 92. Over the southern counties of England, the fall was less than one-third of the average; and in London and Oxford, there was exactly one-quarter of the average quantity. The driest localities were those of the extreme south-east and south-west. The London record for more than 80 years past fails to show any like period at any time of the year with so small a rainfall as that of the present year. In the period under discussion, the total in London was only 1·83 inches; the nearest approach being 2·17 inches—October, 1879, to January, 1880.

LEEDS CORPORATION GAS SUPPLY.

Abolition of Meter-Rents.

At the Meeting of the Leeds City Council last Wednesday—the MAYOR (Mr. T. R. Leuty) presiding—the question of abolishing gas-meter rents was again under consideration.

Mr. J. F. CARTER moved—"That gas-meter rents be abolished within the city of Leeds on and after the 1st day of January, 1894." In support of the motion, he said that 49 towns in England had now adopted the principle which he advocated; and it was working very well. He thought there was no reason why Leeds should not follow suit. The complaint had been made that an increase in the price of gas of 2d. per 1000 cubic feet would be necessitated; but seeing that the present meter-rents brought in an income of £11,000 per annum, and 1d. per 1000 feet of gas realized £9000, the increase could not be more than 1¼d. Moreover, he maintained that a saving would be effected through the adoption of the system.

Alderman SPARK, in seconding the motion, said that he believed the meter-rents were exceedingly unjust to the working classes. Statistics which he had had prepared showed that the average annual gas consumption of 11,830 consumers in the city was 3000 cubic feet; of 31,670 consumers, 6000 feet; of 12,560 consumers, 9000 feet; of 4500 consumers, 12,000 feet; while 13,300 consumers had larger meters, and would not be affected. He contended that, even if the price of gas was increased—and he did not see the slightest necessity why it should be—they ought to be in as good a position as many other towns, which were supplying better gas than Leeds at a lower price. By the abolition of the meter-rents, every one of the 11,830 consumers would pay 1s. 6d. less than now, according to the quantity consumed; the 31,670 consumers would each pay 1s. less; the 12,560 consumers 6d. less; and the 4500 persons would not be affected. And so, as there were about 75,000 consumers in the city, there was only a limited number who would pay more than at present; and for years they had paid less than their proper share. Leeds, he held, was in a miserable position compared with towns like Birmingham and Manchester in regard to the price and quality of the gas. At the proper time, he should be prepared to move that the Council raise the quality of the gas to its parliamentary and legitimate standard. He hoped this meter question was the beginning of a splendid reform in the management of the gas undertaking.

Alderman HENRY complained that Alderman Spark had indicted the Gas Committee without giving notice, so that the defenders of the Committee might have come prepared to reply. He estimated that the coal strike would cost the city £40,000 or £50,000; and therefore from this cause the price of gas must be raised 5d. or 6d.

Mr. HARLAND thought the resolution should not be made operative for six months; so that the Gas Committee might have an opportunity of formulating their views on the whole question, and putting them into practical shape.

Mr. CARTER and Alderman SPARK agreed to amend the resolution to read that the abolition take place "on and after the 1st day of July, 1894."

Mr. P. DENTON believed that Alderman Henry's suggested increase in the price of gas on account of the coal strike was over-estimated; and he thought the deficiency should be met in a special and independent way without raising the price.

Alderman HOLDSWORTH intimated that he was thoroughly opposed to the abolition of the meter-rents.

The resolution, as amended, was adopted by 44 votes to 5.

The Chairmanship of the Gas Committee—Proposed Increase in the Price of Gas.

The Corporation Gas Committee are in a little difficulty regarding the election of a Chairman. At their meeting on the 10th inst., Alderman Gilston, much against his wish, was re-appointed. Subsequently, however, he waited upon the Mayor, and informed him that he could not accept the position. The Committee, it may be stated, is composed of twelve Conservatives and nine Liberals; but, in addition to this, it is said that Alderman Gilston's views on one or two matters connected with the management of the gas-works are at variance with those of the majority of his colleagues. Having formally received Alderman Gilston's resignation, the Mayor summoned a special meeting of the Gas Committee yesterday week to discuss the situation. The Liberals urged the desirability of having a Conservative member as the Chairman; and it was proposed and seconded that Mr. Lowden should hold the office. To this the Conservative members offered strenuous opposition; pointing to the difficulties looming ahead, in consequence of the coal crisis, and to the almost certain increase in the cost of management. They contended that, under the circumstances, the Liberals ought to continue in office. These arguments they followed up by proposing that, despite the objections he had raised, Alderman Gilston be re-elected Chairman. On being put to the vote, the motion that Mr. Lowden should be elected was defeated; and a resolution re-appointing Alderman Gilston was carried. Practically, therefore, there is a deadlock.

The Committee met again last Thursday; but the question of the chairmanship was still undecided. Other important subjects, however, were discussed. A small Sub-Committee was appointed, who will meet at frequent intervals and purchase coal as they think necessary; it being understood that they shall not order more than a week's supply at any one time. There was considerable discussion on the general situation, and the probable effect of the coal strike, and the greatly enhanced prices which have to be paid, on the finances of the Committee. There appeared to be a general feeling that an advance in the price of gas was absolutely necessary, in consequence of the largely increased cost of production; and the Committee resolved to recommend the Council to increase the price 2d. per 1000 cubic feet from Jan. 1, making it 2s. 4d., instead of 2s. 2d. It was roughly estimated that the coal strike will cost the department £40,000; but Alderman Henry pointed out that, by reducing the illuminating power of the gas from 19 to 18 candles, as was decided by the Council some time ago, they had expected to have a balance at the close of the financial year of about £20,000, and the increase of 2d. per 1000 feet would produce £9000 or £10,000, so that they did not anticipate the deficit would be very large. The Committee have now 58,000 tons, chiefly of Durham coal, which have been purchased at a high price. The rate at which coke is being sold at the works was also under consideration; and it was decided, in the event of the conference which took place on Friday last between the coalowners and miners being unsuccessful, to raise the price from 10s. to 12s. 6d. per ton on Monday.

ORIENTAL GAS COMPANY, LIMITED.

Annual Report and Accounts.

The business of this Company during the twelve months ending on June 30 last has made satisfactory progress. A greater quantity of gas has been sold than during the previous year, resulting in an increase of £1486 in the gas-rental; while economy in manufacture has effected a reduction in the quantity of coal used in its production. Aided by a saving in the cost of carriage realized by the construction of the Company's railway siding, a total reduction of nearly £1500 has been effected in the cost of manufacture and distribution. Although the proceeds arising from the sale of coke, tar, &c. (the saleable quantities of which were necessarily diminished owing to the less quantity of coal carbonized), show a falling off, the net result of the year's working, the Directors state, would be entirely satisfactory, but for the fact that the extra profits earned are more than counterbalanced by the loss on exchange, which item amounts to £23,071, as against £19,195 last year—an increase of no less than £3876. This incident, inseparable from the business of the Company, is one which the Board regard with the greatest concern, as it is wholly beyond their power to mitigate or control. They believe they are justified in expressing a hope that during the current year the course of exchange will show an improvement; but, having regard to the still unsettled position of silver, it would not be prudent to form too sanguine an anticipation. The report also mentions that debentures to the value of £6420 have been paid off during the year; thus reducing the liabilities of the Company to that extent. In extension of the Company's operations, 5½ miles of new mains have been laid; 205 additional public lamps have been erected; and 200 new private consumers have been obtained. The Directors announce, with deep regret, the death, since the last general meeting, of their Chairman (Mr. H. M'Lauchlan Backler); and they take the opportunity of recording their high appreciation of the ability and devotion with which he discharged the duties of his office. They further report that Mr. C. Hill has resigned his seat at the Board; and that Mr. R. Hesketh Jones (one of the Auditors) and Mr. H. D. Ellis have been provisionally elected to the vacancies thus caused. To fill the vacancy in the auditorship, Mr. S. W. Savage has been provisionally appointed. The Secretary (Mr. J. G. Drew) having died after a short illness in December last, the Directors have appointed Mr. H. J. Luff as his successor. With regard to the finances, the balance of the general revenue account (after payment of the interim dividend of 4 per cent. in June last) is £25,553, out of which the Directors now recommend a dividend of 4 per cent., free of income-tax, making a total of 8 per cent. for the year, and leaving a balance of £13,553 to be carried forward.

Issue of New Stock by the Newport Gas Company.—A special meeting of the Newport Gas Company was held yesterday week, for the purpose of authorizing the Directors to raise £15,000, either by mortgage or the creation of debenture stock. In moving the adoption of a resolution to this effect, the Chairman (Mr. E. J. Phillips) stated that the Directors had decided to issue debenture stock, bearing interest at 5 per cent. per annum. Of the new stock, £8353 would be issued *pro ratâ* to the present shareholders; and the remainder raised in other ways. It was explained by Alderman H. J. Davis that the money was required for paying for the new holders and other works which had been carried out. The motion was adopted.

The New Water Scheme for Newport (Mon.).—A certain section of the ratepayers of Newport appear to be greatly agitated over the adoption of the Wentwood water scheme by the Corporation; and in order that they might gain some additional information concerning it, they recently requested the Mayor to convene a public meeting to discuss the matter. This was held a short time ago; and, at the outset, Mr. Johns complained that the ratepayers had been kept in ignorance of what was being done. He traced the history of the water supply from 1887, in which year the Corporation opposed the Water Company's Bill, and then purchased their undertaking for £300,000. Information had not been afforded the ratepayers; and from 1887 to the present time, the Corporation had been playing a perfectly fast-and-loose game in regard to the matter. A resolution was moved, requesting the Corporation to re-consider the scheme, "in order that the ratepayers may not be involved in an uncertain outlay of probably £250,000, without ample proof of its success." The motion having been seconded, the Mayor (Mr. T. Jones) addressed the meeting at considerable length. He said the water undertaking paid its way; and provided also for a sinking fund for the purchase of the concern in 60 years' time. They had only 90 million gallons of water in the reservoirs; but they had none to spare, and unless there was a very wet winter, great risk would be run of not being able to fill the reservoirs. It had been suggested that they should obtain a supply from the Severn Tunnel; but it was not a good drinking water, because of the mineral and saline constituents, and for domestic use its hardness was a great objection. The estimated quantity of this water was 320 million gallons per year. It was offered to the Corporation for £4500 per annum, or at a capitalized value of £150,000; but it would have to be pumped to the top of Christchurch Hill, and then chemically treated. It was expected that they would obtain from Wentwood double the quantity, or 600 million gallons. Mr. C. Kirby, the Engineer of the scheme, gave some details respecting it; and after a number of questions had been answered, an amendment endorsing the Corporation's action was carried by an overwhelming majority.

MR. GEORGE LIVESEY ON LABOUR TOPICS.

Opening of a Reading and Recreation Room at the West Greenwich Gas-Works.

Last Friday, Mr. George Livesey inaugurated a new recreation and reading room for the workmen at the West Greenwich station of the South Metropolitan Gas Company. The want of such a room has been greatly felt by the men; and the enthusiasm which was displayed by them during the proceedings on Friday seems to indicate that they intend putting it to good use, and so assure the Directors that they were justified in expending the money upon its erection.

The building is well arranged for the purposes to which it is to be devoted. The dimensions of the main portion are 60 ft. by 25 ft.; and it will seat about 300 men. At one end is a platform, which will be useful for meetings and entertainments; and beyond this are two rooms—one destined for use as a Committee-room and the other as a kitchen. The latter is fitted with tea, coffee, and cooking utensils—all heated by gas. The whole building is lighted by regenerative lamps, and warmed by gas-stoves. Daily papers and suitable periodicals are to be supplied to the room; and a piece of land adjoining is to be laid out shortly for quoits, bowls, and skittles.

The men having assembled in the room, Mr. LIVESEY took the chair, and with him were the Company's Chief Engineer (Mr. Frank Livesey), the Secretary (Mr. Frank Bush), Mr. J. F. Braidwood, the Engineer of the West Greenwich works, Mr. C. C. Carpenter (Vauxhall), Mr. J. Tysoe (East Greenwich), Mr. A. F. Browne (Rotherhithe), and the station Workmen's Committee.

Mr. J. COOPER commenced the proceedings by reading, on behalf of the Committee and the men, an address, in which the Directors were warmly thanked for their kindness in allowing the building to be erected, and Mr. Livesey for having responded to the invitation of the men to open it.

Mr. LIVESEY, in reply, assured those present that it was a matter of great gratification to him to know that the invitation to be there that day emanated from the men themselves. He was particularly pleased to visit the Greenwich works, because of all the Company's stations the men there, he thought, had shown most confidence in the Company. He found, from figures he had before him, that 56 or 57 per cent. of the men at that station left their bonus money in the hands of the Company; while at one station the percentage was only 18, and the average of the whole of the stations was 44 per cent. Proceeding to speak upon some current topics, he said that the other day he came across this little paragraph in a letter in the *Echo*: "Is it just that, out of £1,350,000,000—the worth of the national cake—the producers of that wealth should enjoy but £450,000,000, or one-third of their real earnings?" The writer of this wished to make out that the whole product or result of the working of the workers belonged to them; and Mr. Livesey went on to show the absurdity of such a contention. Among other examples, he referred to the driver of the engine and exhauster at the station. Suppose, he said, that man was to stop, and no one else could be got to do his work, they would lose quite 400,000 cubic feet of gas per day by leakage through the retorts. When they stopped their exhausters some 42 years ago for repairs, he found that the make of gas per ton of coal dropped something like 2000 cubic feet in a week. Some people might say that the value of the engine-driver's work at the station was the value of the result of that work. But, of course, it was not. The whole of their working together and the use of the various appliances enabled them to effect the saving. Clay retorts would never have been used but for the invention of the exhauster. He was old enough to remember when iron retorts were employed; and, if they had been worked at the heats at which clay retorts were now worked, they would have been melted in a week. At last someone said that fire-clay could be used; but it was pointed out that it was not gas-tight. Then an ingenious man suggested that they should pump the gas away from the retorts as fast as it was made. He remembered the invention of Beale's exhauster. Mr. Beale was a born inventor; he devised all sorts of things. He invented a lamp for burning tar; and the gas companies were so afraid this was going to interfere with their business that they bought it, and it was lost sight of. Then he brought out a rotary steam-engine; but it was not so successful as the reciprocating engine, and it failed. Then came clay retorts; and Mr. Beale converted his steam-engine into an exhauster, and that was the one in use at the present day. When he died, Mr. Beale left £100,000 to his family; and he richly deserved it. The engine-driver and all of them were participators in what Mr. Beale and the inventors of clay retorts had enabled them to do; so that the engine-driver could not say he alone produced the saving of the 400,000 cubic feet of gas per day. Mr. Livesey also made a similar comparison between the cost of the conveyance of the Company's coal by sailing vessels many years ago and by steamers at the present day, and of the difference in the time occupied in unloading the vessels then and now. By the introduction of steamers, he said, the Company saved something like £100,000 a year. Of this sum, the consumer had obtained the greater part—certainly £80,000—in the reduction of the price charged for gas; and the remainder was divided between the workmen and the shareholders. It was therefore foolish for people to talk about a man being entitled to everything he produced, because he was only able to produce what he did by the labour of others. Again, in their own case they had made some improvements. For instance, gasholders used to cost £20 per 1000 cubic feet capacity to construct; but now they had succeeded in reducing it to £5. The large holder at East Greenwich only cost £5 per 1000 cubic feet capacity. These holders alone made a difference in the cost of gas. They had to spend less capital, and consequently there was less interest to pay; and so they were enabled to reduce the price of gas to the consumers. Steamers for conveying the coal had enabled them to lower the price 4d. per 1000 cubic feet; the use of exhausters and fire-clay retorts, a further 3d.; and the reduction in the cost of constructing gasholders, another 1d. If they added these savings to the price they now charged for gas, they would make it 3s. 1d. per 1000 cubic feet; and the result would be that everybody would be dissatisfied. Economic laws and the "living-wage" question were also dwelt upon by Mr. Livesey. In connection with the last-named subject, he amused the men by stating that he saw the London County Council (some of the members of which had a good deal to say upon the "living-wage") had been advertising for a plant-list clerk, between 25 and 35 years of age, at the "living-wage" of 25s. per week! At such a wage as this, a man having to keep up a respectable appearance, and perhaps support a wife and family, was in a worse position than most working men. Now, according to a report issued by the Board of Trade, gas workers were receiving higher wages than any other class of unskilled workers; and, in his opinion, it was right and fair it should be so. Mr. Livesey next commented upon the speech made by Mr. Burns in the House of Commons, on the previous Friday evening, in the course of the debate on the Employers' Liability Bill. With regard to Mr. Burns's assertion that the Company's men had been coerced and intimidated into signing the petition in favour of the contracting-out clause, he stated that the action of the men as to petitioning was decided upon by the men's own Committee; that the men were asked to sign it by their own representatives; and that the Directors and officials had nothing whatever to do with it. He did not think Mr. Burns had acted as a gentleman in this matter. He had had his (Mr. Livesey's) word; while, on the other hand, he had had a letter—which he read in the House—from a man whose name he did not dare to give. In concluding his speech, Mr. Livesey declared the room open.

Mr. BRAIDWOOD and two of the men (Messrs. Pittock and Sellens) also addressed the meeting; and a vote of thanks to Mr. Livesey terminated a very pleasant gathering.

MR. F. T. C. LINTON ON PREPAYMENT METERS.

In our Scotch Correspondent's "Notes" on the 7th inst., reference was made to a report on prepayment meters, prepared by Mr. F. T. C. Linton, Engineer of the Leith station of the Edinburgh and Leith Gas Commissioners, which came before the Commissioners at their meeting on the 30th ult. Although, as mentioned by our correspondent, the report was not adopted, it may be of interest to our readers to reproduce the principal portions of it.

Mr. Linton began by alluding to the extensive adoption of prepayment meters in London and some other English towns where gas pipes and fittings have not hitherto been fixed in any but the larger buildings. The occupants of the smaller houses had, he said, hitherto been left to supply themselves with oil or candles for lighting purposes; and consequently there was a large field to be acquired for gas consumption, now that the prepayment meter afforded the opportunity of selling small quantities of gas without any risk of loss or bad debts being incurred. This was being taken advantage of by companies and corporations, who were supplying and fixing pipes and fittings with prepayment meters, and recouping themselves for the cost of doing so by regulating the quantity of gas given for a penny. After a few further observations, in which he briefly alluded to the mechanism of the new meters, and compared their price with those of the ordinary construction, Mr. Linton proceeded as follows.

In considering whether it would be desirable for the Commissioners to adopt these meters in their district, it will be proper, in the first place, to see if there exists here any such field to be acquired for gas consumption as exists in some English towns, because we know generally that here gas is laid on and gas-fittings are fixed in almost every house, however small. The following table gives the proportion of gas consumers to the population here and in various English towns, as well as in Glasgow and Dublin, together with the quantity of gas sold per consumer:—

Name of Town.	Population.	Number of Consumers.	Number of Persons to Each Consumer.	Gas Sold per Consumer. Cubic Feet.
Greater London*	5,700,000	387,982	14·69	83,433
Bristol	225,592	22,585	10·00	56,213
Plymouth	85,610	10,175	8·41	50,613
Birmingham	483,526	57,534	8·40	66,037
Liverpool	513,790	67,300	7·63	42,811
Leicester	180,066	24,369	7·39	39,945
Brighton	116,424	16,583	7·00	49,692
Sheffield	329,585	48,109	6·85	34,340
Newcastle-upon-Tyne	192,205	30,000	6·41	49,969
Manchester	511,000	80,571	6·34	36,275
Dublin	349,594	16,000	21·85	64,605
Glasgow	677,883	139,013	4·88	21,218
Edinburgh and Leith	342,000	61,397	5·57	20,071

* Three Metropolitan and twelve Suburban Companies.

This shows that here (as in Glasgow and Scotland generally) gas is used in nearly all households, and also used in a large proportion of families in North of England towns, but that in London and other towns in the South of England it is not employed to anything like the same extent. In London, only about one family in three, and in Dublin less than one in four, uses gas. As five is about the average number in a family in this country, and as the proportion is probably higher than the average in Edinburgh, it is apparent that the number of families not using gas in Edinburgh and Leith is small, and that little new business could be got by adopting the prepayment meter system. There is little doubt, however, that, were the Commissioners to sanction the issuing of these meters, it would be regarded as a boon, and largely taken advantage of by the great number of small consumers, who at present have to leave a money deposit of 7s. 6d. and upwards before getting a supply of gas.

Subjoined is a statement, obtained from the collectors' department, of the number of small accounts under 10s., between 10s. and 15s.,

and between 15s. and 20s. per annum; and of these about 11,000 have deposits lying with the Commissioners:—

Total number of consumers		61,397
" "	under 10s.	8783
" "	10s. to 15s.	6251
" "	15s. to 20s.	7851
Total number of small consumers		22,885
Percentage of "	"	37·27

The amount of money on deposit at present is £5398; and the Commissioners are probably aware that much grumbling and objection goes on about these deposits, which are, no doubt, a hardship to poor people. The adoption of these meters would remove this grievance. But it would probably cost from £20,000 to £30,000 to supply the meters needed to replace those presently in use by the 11,000 depositors; and, as above shown, there would be little in the way of increased business to recoup the expenditure. However, that could, of course, be met by regulating the quantity of gas given for a penny so as to cover a part or the whole of it. The average quantity of gas used by consumers of less than 20s. worth per annum is about 4000 cubic feet. If the gas supplied for a penny were made 20 instead of 24 cubic feet (which is the quantity at 3s. 6d. per 1000 cubic feet), this would give 2s. 8d. per annum on a consumption of 4000 cubic feet to meet the expense incurred for the meter.

THE MANUFACTURE OF GAS FROM PEAT.

The following report on "The Manufacture of Gas from Peat," by Mr. F. T. C. Linton, the Engineer of the Leith Gas-Works, was submitted to the Edinburgh and Leith Gas Commissioners at their meeting on Monday last week, and was adopted by them:—

The following experiments as to the value of peat for the manufacture of illuminating gas were made in accordance with the instructions of the Works Committee. As suggested by Councillor Sloan (at whose instigation the Committee ordered the experiments to be made), a quantity of black peat was procured from the Wellington Reformatory Farm, Penicuik; but, as the results from it were entirely worthless, owing not only to the quality of the peat, but to its being in an undried state, it was resolved to procure other samples dried in the usual manner. One of these samples was procured through Messrs. James Waldie and Sons, and came from the Leadburn district; the other was obtained from Messrs. Bernard and Co., and came from Orkney. The subjoined results give the average of several trials of each sample.

I.—Peat from Wellington Reformatory Farm.

Preliminary Examination.

	Per Cent.
Water expelled at 212° Fahr.	88·40
Volatile matter	7·80
Coke	3·80
	100·00

As it would have been useless to attempt the distillation of material so saturated with water, the peat to be experimented with was dried as much as possible in one of the retort-houses for 24 hours, and thereby deprived of water to the extent of 72 per cent. by weight. The average result of four trials, stated per ton of peat as received, and costing 3s. 4d. per ton, was as follows:—

Gas per ton of peat	2116 cubic feet.
Illuminating power of gas	1·28 candles.
Coke	378 lbs.
Tar	5¼ gallons.

The coke was very light and friable, resembling burnt straw, and was of no value; and the ammoniacal liquor also was too weak to be of any use. The crude gas contained 23 per cent. of carbon dioxide.

II.—Dried Peat from the Leadburn District.

Preliminary Examination.

	Per Cent.
Water expelled at 212° Fahr.	34·34
Volatile matter	43·50
Coke	22·16
	100·00

The average of three trials gave—

Gas per ton of peat	5404 cubic feet.
Illuminating power of gas	2·26 candles.
Coke	1372 lbs.
Tar	7 gallons.

The coke retained its shape as put into the retorts; but it was very soft and friable, and of little value, and the ammoniacal liquor was too weak to be of any use. The crude gas contained 20½ per cent. of carbon dioxide. This peat cost 27s. per ton.

III.—Peat from Orkney.

This peat was said to have been dug in Orkney about ten years ago, and to have been stored in Messrs. Bernard and Co.'s premises in Haddington since then. It was very hard, dry, and compact.

Preliminary Examination.

Water expelled at 212° Fahr.	16·00
Volatile matter	55·50
Coke	28·50
	100·00

The average of three trials gave—

Gas per ton of peat	9791 cubic feet.
Illuminating power of gas	9·69 candles.
Coke	812 lbs.
Tar	10½ gallons.

The coke was of fairly good quality, dull black in colour, and producing a metallic sound when struck, like coke from coal. It might be about the same value as coke from inferior cannel. The ammoniacal liquor was somewhat stronger than in the other two samples, but not strong enough to have any marketable value. The crude gas contained 18½ per cent. of carbon dioxide. This peat cost 27s. per ton.

The results are very similar to many other recorded experiments with peat, and show that it varies very greatly in quality; the Orkney peat having, for gas-making purposes, 8 times the value of the Leadburn peat, and 35 times the value of the Wellington Farm peat—in fact, the peats in this district seem to be of no value whatever for gas making. The Orkney peat may be taken as representing the best quality of peat in this country. As, however, common splint coals, costing just now from 8s. 6d. to 9s. per ton, yield 10,000 cubic feet of 15-candle gas per ton, and 12 to 13 cwt. of excellent coke, worth about 5s., and also 20 gallons of tar and 35 gallons of ammoniacal liquor, worth about 2s. 8d., it is evident that even the best quality peat cannot compete at all, in this country, with coal for gas-making purposes.

There are, moreover, other drawbacks, besides the hopelessly inferior results yielded, to be considered. The excessive proportion of carbon dioxide produced (from six to seven times as much as in crude coal gas), which has to be removed from the gas, would make the cost of purification enormous. A large company formed in France some years ago to manufacture gas from peat came to grief mainly over this very point, as they found it cost them 7s. for lime to purify the gas from a ton of peat, as compared with 4d. for purifying the gas from a ton of coal. The retorts would also require to be more than double the number needed for a similar quantity of coal gas, owing to the peat being so much more bulky in relation to its weight; and they would also have to be of iron instead of fire-clay, which would very greatly enhance the cost for plant, and necessitate working at a low heat, or the iron retorts would be rapidly burnt away. The reason for this is that coal makes a deposit of graphite in the retorts, which rapidly fills up all the pores of the fire-clay retorts, and makes them quite tight. Peat makes no such deposit; and the gas from it would escape largely through the fire-clay.

Peat gas is made in some remote parts of the Continent, in which specially good beds of peat exist, and which are far away from any coal supply; and it is only in such circumstances that experience has shown it to be possible to make it profitably. It is found to be necessary to submit the peat, after being dried, to great pressure; and frequently it is saturated with oil before being distilled. The apparatus used and the methods of treatment differ greatly from those employed for coal gas; and the resulting gas probably costs from three to five times as much as gas of similar quality in this country made from coal.

THE EARLY HISTORY OF THE CARDIFF GAS COMPANY.

Under the heading of "Records of Old Cardiff," the *South Wales Daily News* of last Wednesday published an article the material for which was extracted from the minute book of the Cardiff Commissioners from 1815 to 1837, which is now in the possession of the present Mayor (Mr. W. J. Trounce). In the course of the article, the following interesting references are made to the first few years' lighting of the town by gas:—

In the early part of the present century, the town was lighted by oil-lamps; these being lit at nights for a portion of the year only. The lighting, like everything else, was done by contract; and, in order to preserve the lights from maliciously disposed persons, a staff of watchmen were appointed by the Commissioners, who also keenly looked after the quantity and quality of the oil supplied, for they in 1819 made the landlords of the Angel Arms and the Cardiff Arms pay for the extra quantities they consumed. The contract price for lighting the town from Dec. 25, 1819, to March 25, 1820, was £39. At a meeting of the Commissioners on April 4, 1821, however, a Mr. Broadmeadow attended, and proposed that, if a convenient piece of ground could be provided for a gasholder, he would be at the sole expense of lighting the town with gas (the first cost of the lamps and the tubes from the surface upwards excepted), on receiving for each lamp £2 a year, the lights not to be more than 40 yards apart; that he should be at liberty to make his own bargain as to private lights; that he would admit the Commissioners as sharers in the expense and profits in any proportion they thought fit; and that he would at any future time sell his share or the whole concern to the Commissioners, if they should be desirous of purchasing, on these terms: "If the concern shall clear 15 per cent. per annum on the sum expended (say, £1000), Mr. Broadmeadow will sell for £1500, being ten years' purchase, and so on in the same proportion." At the subsequent meeting, the Commissioners entered into a treaty with Mr. Broadmeadow that he should light the town with gas for a term of 21 years, with the alteration that £2 5s. be paid for each lamp, the lamps and fittings to be found by Mr. Broadmeadow; and the Clerk was instructed to apply to the churchwardens and overseers for the united parishes of St. John and St. Mary for a 99 years' lease of a garden "now held by Mr. Evan Lewis, as Parish Clerk, at the annual rent of 3 gs." for erecting thereon a gasholder and other works for the purpose of lighting the town—he being also ordered to apply to the Corporation for leave to go through "that part of the town wall which is between the Clerk's garden and the Glamorganshire Canal" for the purpose specified, "and also for permission to use the stones of that part of the wall so to be taken down." Where the garden was situated, is not more specifically described. At any rate, it was obtained—the Commissioners agreeing to pay an annual rent of £4 for it; and the gas-works were built. Later on Mr. Broadmeadow apparently saw better than the Commissioners did the prospective value of the concern; and, on July 16, 1821, he made them a proposal to the effect that, if they would give up their right as sharers in or purchasers of it, he would light the town every night in the year for £2 5s. per lamp, instead of lighting the lamps for seven months only. These terms might have suggested to the Commissioners that the thing was worth having; but they lived at a time when the doctrine of "municipalization of monopolies" was neither understood nor discussed. At any rate, they accepted Mr. Broadmeadow's

offer. But they had soon to complain of the erratic and bad lighting by the contractor; and they were not slow in penalizing him by deducting from the contract money a proportion they considered fair for his dereliction of duty. For instance, in 1822 a Committee reported that they had examined the gaslight account for the half year ended March 25, amounting to £67 10s. (for 60 lamps at 45s. each per annum); and, on their recommendation, £34 2s. 6d. was deducted for lamps not lit, &c. Early in 1822, Mr. Broadmeadow disposed of the gas-works to a Company, who took over the public lighting contract as well; but matters got worse rather than better. The Company, in 1823, seemed to think they were giving too much for the money; and, notwithstanding the contract, wrote representing to the Commissioners that, as they were lighting the town at a loss, they should be paid £3 3s. for each lamp, instead of £2 5s. The Commissioners would give no concession, however. Subsequent minutes teem with copies of complaints made by the Commissioners, and deductions from the contract price because of defective lighting; and in the end of 1826, the Commissioners ordered that, "in consequence of the shameful state of the lamps and burners, no money be paid to the contractors for lighting the town until the lamps, &c., are put into proper repair and the gas be of the best quality." Later minutes show that the money was paid; so it may be inferred that the drastic method of stopping the money brought the Company to a sense of their duty. "Ever since," the article proceeds, "it has been a standing complaint by the Corporation to the Gas Company that the town has been, and is now, badly lighted; and, as the years have gone by, the Company have become bolder—so bold, indeed, as to treat the Corporation with unconcealed contempt. It was only a week or two ago that the Company, through their Solicitors, told the Corporation that the Directors were not prepared in future to do more than supply the public lamps with gas in accordance with their statutory liability, and that all questions of lighting, extinguishing, repairs, and maintenance would have to be dealt with by the Corporation. Neither the Commissioners nor the Corporation seem to have known—nor do the latter seem to do now—their own minds on the subject, or what were or are the obligations of the Gas Company, so they quietly and meekly reply asking what the cost of supplying gas only will be. The Solicitors have not replied. Will not the Corporation have to become considerably greater employers of labour now if they have to do the lighting, extinguishing, repairs, and maintenance?'

THE BRUSSELS ELECTRIC LIGHTING SCHEME.

The Brussels central electric lighting station was formally opened on the 9th inst., in the presence of the Burgomaster, sheriffs, and members of the Municipal Council. The work of constructing and equipping the station and laying the conductors was, it may be remembered, entrusted to the India-Rubber, Gutta-Percha, and Telegraph Company, Limited, of Silvertown, who completed their contract in eight months from the time the ground was placed at their disposal—viz., Feb. 15 last. The station has been laid out for the supply of 20,000 lamps of 16-candle power; and on the opening day there were in position two steam-engines, each of 500-horse power, and the generating plant, together with a battery of accumulators, capable, with the necessary reserve, of serving 5000 lamps; and additions will be made as they are called for up to the full limits of the station. The current will be sent out on the low-pressure system from sub-stations served by feeders. The working plant will run from sunset till midnight, after which time electricity will be furnished to the consumers by the accumulators. These are of the Julien type, and they contain 140 couples; the plates having a total weight of about 720 lbs., including the connections. The weight of the battery already mounted is 80 tons; and it has been so arranged as to allow of a second one, quite similar, being placed above it, as soon as it is required by the increased demand. The accumulators are guaranteed to yield a minimum of 70 per cent. of energy; and each couple is capable of delivering 350 ampères of current during 10 hours. Under exceptional circumstances, the battery could furnish 1400 ampères for 30 minutes. At the close of the inaugural ceremony, lunch was served, under the presidency of Mr. E. Gray, the representative of the concessionary Company. The Burgomaster complimented the contractors upon the manner they had fulfilled their engagements; and Mr. Gray, in reply, referred in eulogistic terms to the work of Mr. St. A. Russell, their Engineer, in connection with carrying out the undertaking.

The electric lighting scheme which has now been brought to completion was for a very long time under consideration by the Municipal Council. Eventually a decision was arrived at, and, as already mentioned, the contract was handed over to the English Company. "It may not be without interest," writes a Brussels correspondent, "to call to mind the circumstances which accompanied the placing of the contract. The Company's agent brought an accusation against a member of the Council—M. Bède—of having indirectly demanded a bribe to the amount of 60,000 frs. for his support to the project, on the penalty of having his opposition to it if the bribe were refused. After this accusation was made, the Council decided not to pay any attention to that gentleman's criticisms, which appeared to them to be interested, though it must be acknowledged that he was the only engineer in the body—all the other councillors being either lawyers or merchants. One member went so far as to declare that he would never sit again with M. Bède. An action for defamation of character was brought against the agent; but it was decided that there were insufficient grounds for the suit. However, the Court established the fact that M. Bède's honour was safe. In face of this decision, he was perforce once more permitted to take his seat in the Council; and the gentleman who said he would never sit with him has not sent in his resignation. All these little incidents really helped in getting the electric lighting scheme entrusted to the India-Rubber Company. The Committee who had the matter in hand could not brook anything which seemed like opposition to the project they had so dearly at heart. The works have now been carried out; and they have not presented anything very extraordinary except in one respect. It is generally known that the system of distribution employed by the Company is that of cables enclosed in cast-iron tubes; and it was stated by them that this plan would allow of the wires being drawn through the pipes with the greatest facility. It is possible that, on flat ground, or in towns where the differences in level are not very great, this system may be a fairly good one; but in an uneven street, I have seen 27 men employed in drawing a cable into a pipe. It is needless to say that the insulation was damaged. The future alone will show us the numerous inconveniences attending this system."

HALIFAX CORPORATION WATER SUPPLY.

Statistics as to Present Position and Prospects.

At the Meeting of the County Borough Council of Halifax on the 9th inst., the newly-elected Mayor (Alderman Midgley), in the course of his address to the members, gave some very interesting figures with regard to the present yield of the Corporation water-works, and their sufficiency for the supply of the town and district in times of drought. He stated that the reservoirs had, in round figures, a capacity of 1400 million gallons. For compensation they had to give daily 4,050,000 gallons; last year the Local Boards took 1,875,082 gallons; the supply by meter for trade purposes was 1,173,161 gallons; and the domestic consumption, allowing 15 gallons per head, reached 1,335,000 gallons. The total quantity of water sold and used was 4,383,243 gallons; and reckoning a leakage of 616,757 gallons, made a total of 5,000,000 gallons daily passing into the mains. It had been estimated that the yield of their streams and springs over 150 days' drought was 2,750,000 gallons a day. Multiplying this by 150 days, and they had 413 million gallons, which must be added to the 1400 millions. With regard to compensation, he should mention that they did not pay it out on Sundays; and 21 Sundays in 150 days, at 4,050,000 gallons a day, would represent 85 million gallons—making a total of 1898 millions. As he had said, the average daily quantity taken from the reservoirs last year was 5,000,000 gallons; and to this must be added the compensation of 4,050,000 gallons—making a total of 9,050,000 gallons. During a drought they had always an increased demand, both from the Local Boards and others; and they could not get off with less than a daily supply of 10 million gallons. Again, though they had 1898 million gallons of water, seeing that it was distributed among thirteen reservoirs, they could not deduct less than 200 millions as being unfit for domestic use, as it would be literally full of animal and vegetable matter. Even though during this season they had not had a stock of less than 500 million gallons, they had complaints of impurities being in the water; so that if they deducted 200 millions from the 1898 millions, they had (say) 1700 millions available. Seeing that they required 10 million gallons of water a day, they should have (assuming all the reservoirs were full at the commencement of a dry season) a supply for 170 days. Should, however, a drought commence after a severe frost, the reservoirs would not be by any means full. The next question was, How soon would it be before new works were required? During last year the average daily quantity of water required was 5,000,000 gallons; and Morley took nearly 500,000 gallons a day. The average daily increase was above 100,000 gallons. Should, therefore, Morley cease to take water, they would have a supply to meet their growth for five years. Seeing that it would take five years to build new reservoirs, they were just in the same position that day as they would be when the reservoirs were completed, were their construction commenced at once. Reporting upon this matter in September, 1887, Mr. Hill, of Manchester, said: "It is quite clear that your present works are insufficient for giving a full supply of water for all purposes during a long drought; and that, when the future wants of the district of supply are considered, it is seen at once that your existing works must be extended, and further drainage taken up in connection therewith." Mr. Hill told them that the drought in 1887 lasted about 212 days; and that of 1868 covered 150 days. He further advised that 200 days' storeage should be provided as the shortest period to be contemplated. He (the Mayor) did not say the time had arrived to commence constructing new reservoirs; but it was clear the responsibility rested on the Council. It would be for the Water Committee to consider the situation; and the Council must decide on it in due course.

KENDAL WATER SUPPLY.

The Present Works and Proposed Extensions.

A voluminous and interesting eport on the subject of the water supply of Kendal has been prepared by Mr. G. F. Deacon, M.Inst.C.E., for the Corporation, who are going to Parliament for powers to carry out his suggestions. Dealing, in the first place, with the existing gravitation works, he points out that the late Mr. Bateman designed two impounding reservoirs. One of these was constructed, and contains about 15 million gallons; but the second, which was intended by Mr. Bateman to contain about 18 million gallons, has since been constructed to hold only about 3 million gallons. The consequence is that during most winters more than half the water overflows, and during most summers the source is inadequate. To supplement the supply, the Kendal Union Gas and Water Company established in the year 1868 a temporary pumping-station at Mint's Feet; and during last summer this station, which has taken an enlarged and more permanent form, became the only source of supply to the town. The engines and pumps were, however, not designed to meet this emergency; and they naturally failed to do so. Mr. Deacon, in his report, discussed, at considerable length, the reason why this source of supply should be abandoned. His conclusion is that the water from Mint's Feet—which is largely drawn from the River Mint—can only be rendered safe by efficient artificial filtration. This would involve the construction of additional low-level pumping-engines, to lift the water to filter-beds at a level from which they could be drained, and an independent clear-water tank, in which the filtered water could be stored, and from which it could be pumped into the town. Apart from the cost of this work, Mr. Deacon fears that difficulties might

arise as to compensation for abstraction of the river water, besides which the supply would always be open to question. After observing that the mains are generally of sufficient size, Mr. Deacon describes his scheme for supplementing the supply. As the site of Mr. Bateman's principal reservoir has been occupied by the construction of a reservoir of almost insignificant capacity, and as there is no other suitable site available within the watershed, the only chance of utilizing the present drainage area is to find a reservoir site within an adjoining watershed, to which some of the water now wasted could be economically conveyed. Such a site he has found. He proposes to construct a reservoir, to be called the Fisher Tarn reservoir, by the formation of a dam, to impound the upper water of the Beehive Beck, a tributary of the River Beetham. The drainage area for this proposed reservoir adjoins, and lies to the west of, that portion of the drainage area of the River Kent upon which the existing reservoirs are situated; while the levels are such that one-fourth of the water passing into the existing reservoirs could be diverted into the new reservoir. The total drainage area now available exceeds 427 acres; the mean rainfall is 53 inches; and sufficient water could be stored to provide, in addition to compensation, a constant and unrestricted supply for 25,000 people. While filtration of the water from this new source cannot be said to be necessary on the ground of health, Mr. Deacon thinks the present water should be filtered; and it would therefore be well to make the filters of sufficient size for the treatment of the whole supply. If this were done, and a constant supply ensured, the water would be delivered to the houses in a condition of almost ideal purity. Mr. Deacon reports on other sites which were suggested, but which he regards as less satisfactory. He then deals with the cost of the scheme he proposes, which he roughly estimates at £24,000. Efficient filter-beds and clear-water tanks will add about £4000. The maintenance of the present inadequate supply from the pumping-station costs from £800 to £900 per annum, which, if capitalized, would represent nearly the proposed expenditure. The expense of so extending and altering the pumping-station as to render it sufficient for the constant supply of Kendal would, including the capitalized expense of pumping, greatly exceed the cost of extending the gravitation works as proposed. The detection and suppression of leakage required immediate attention, and would probably cost from £1000 to £1500.

New Water Supply for Northallerton.—The new water-works for Northallerton, the construction of which have occupied the past two years, have been completed; and the water was distributed in the town for the first time yesterday week. The supply is derived from the hills of Osmotherly—a distance of seven miles; and the cost of the works has been about £5000.

Cheltenham and the Electric Light.—Colonel J. Ord Hasted, R.E., of the Local Government Board, held an inquiry last Wednesday relative to an application by the Cheltenham Corporation for sanction to borrow £16,000 for the purpose of installing the electric light in the borough. Evidence in support of the scheme, which has received the approval of Professor Ayrton and Mr. Preece, was given by the Town Clerk (Mr. G. Norman) and the Borough Surveyor, from which it appeared that the installation, which was to be on the high current alternating system, was to be for private service, while the matter of street lighting was deferred. The destructor was proposed to be used as the central station (60-horse power being available there for the purpose), with sub-stations in different parts of the town. There was strong opposition to the scheme on the grounds that the expense ought not to be incurred; that the estimate of the cost was not sufficient for all that the scheme would lead to; and that the ratepayers had not had sufficient opportunity of discussing the question. The Inspector promised to submit these representations to the Local Government Board.

Singapore Gas Company, Limited.—Reporting upon the operations of this Company during the half year ending June 30 last, the Directors remark that, considering the phenomenal dulness of trade at Singapore, and the unprecedented lowness in exchange, the working has been fairly satisfactory. The sales of residuals show some falling off; but the gas and meter rental has altered but little from the preceding six months, and exhibits an improvement compared with that for the corresponding half of 1892. The loss on exchange is less, in consequence of the small amount of cash sent home during the six months. After sundry amounts have been written off for depreciation, &c., the accounts show a balance of £1067, which, taking into consideration the present very low and uncertain state of exchange, the Directors reluctantly recommend should be carried forward. They also announce, with sincere regret, the death of their esteemed colleague and Chairman (Mr. R. S. Foreman), and state that Mr. W. T. Batten, the late Manager of the Company at Singapore, has been elected to fill the vacancy on the Board, while Mr. S. Spencer has been chosen to take the position of Chairman.

Conviction for Stealing Gas.—At the County of London Sessions last Wednesday, James Ford, a builder's foreman, surrendered to his bail to answer a charge of stealing a quantity of gas, valued at 10s., the property of the South Metropolitan Gas Company. Mr. Besley, who appeared for the prosecutors, in briefly reciting the facts of the case, said the Company did not desire to ask for any vindictive punishment; all they wished was to protect themselves against fraud of a similar character. The prisoner was an operative builder; and his wife had a house in Shakespeare Road, Brixton, to which a supply of gas was laid on. Early in October, some of the Company's men were carrying out certain repairs in the house next to that occupied by the prisoner, when his wife complained to them of the defective supply of gas. The men went to examine the fittings, and discovered that a surreptitious pipe had been laid on from the main which conveyed the gas into the house to be burned, without passing through a meter to be registered. Mr. Wilkinson, for the defence, called witnesses, who gave the prisoner a very good character. Sir Peter Edlin said the prisoner had shown an extraordinary amount of cunning; but the fraud was fortunately discovered before any very great loss was incurred. He sentenced him to ten weeks' hard labour.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

Although it was a special meeting, the Edinburgh and Leith Gas Commissioners had one of the most interesting meetings they have held for a long time on Monday. The object of it was to sanction the application to Parliament for powers to extend the Leith Gas-Works; and this was done. The proposal is to borrow £100,000; and in connection with this, it is interesting to notice that the Commissioners seek power to borrow, on deposit or in any other manner, and from any parties willing to lend, any sums they may require, and which they may be entitled to borrow. This, Mr. Kinloch Anderson, who presided, explained would enable them to get money from the public at a less rate than from the banks. He also said that at the present time they had borrowing powers to the amount of about £150,000; but that, if they took the £100,000 out of that, they would only have £50,000 left. The Treasurer had informed him that their capital expenditure was about £12,000 a year; and therefore £50,000 would not last long.

Another subject—which will be of more interest to gas managers than it was to the Commissioners—was Mr. Linton's exhaustive report on the manufacture of gas from peat.* The inquiry was entered upon on account of the zeal of a not over-well informed town councillor. The results Mr. Linton arrived at are not new, but they are placed in a fresh setting; and gas managers must feel indebted to him for the clear way in which he has stated his conclusions.

Events have moved rapidly in Falkirk this week. A special meeting of the Town Council was held on Wednesday, to consider what should be done in view of the Gas Company having given notice of a Bill for next session, giving them enlarged powers. The councillors met in panic; and they resolved, without a dissentient voice, to go to Parliament also, asking power to take over the undertaking of the Company. Accordingly, the usual parliamentary notice is published to-day. The Council propose to acquire the same lands as the Company have scheduled in their application. They also propose to pay the purchase price of the Company's undertaking, to dissolve the Company, and to distribute its assets among the shareholders. I suppose what moves them to adopt this method, in preference to the more common one of paying annuities, is that the Council expect to be able to borrow money cheaply—at somewhere about 3 per cent.—which would enable them to pay the Company right off at once. It was stated at the meeting that they propose to take over the undertaking at the valuation of the works, and not upon the basis of the dividends. I am afraid the Council are forgetting that, in taking the undertaking over in this way, they will have to pay a large sum for the Company's good-will, which they would not do by the annuity method. What frightens the Council is that, if the Company get their Bill, they will entrench themselves in such a way that it will be next to impossible at any future time to take them over. They are startled at the proposition to take powers for the opening up of streets; and at the proposal which is said to be, not in the Bill, but under it, to take 10 per cent. of a dividend. I suppose that is by the sliding scale, but this the councillors do not seem to understand it. While the Council have resolved to go to Parliament, they also came to the conclusion that it would be advisable, in order to get time for negotiation, that the Gas Company should be approached and asked to withdraw their Bill for a year. A Committee was appointed to meet the Directors upon the subject. They are prepared to go forward, however, if these negotiations should come to nothing, which they most probably will do.

Oil gas is booming this week. At Perth, Mr. Whimster, one of the oldest, if not the oldest Gas Manager in Scotland, has shown that he is desirous of being abreast of the age by introducing an installation of the Peebles process. Nine retorts, in series of threes, have been fitted up. The oil is run in a pipe from the railway yard, into a tank sunk in the ground within the gas-works, which is capable of holding 10,000 gallons. From there, it is pumped to the cistern on top of the scrubber, from whence it enters the system in the way now well known. The advantages to be derived by the use of the process are summed up as follows: Last year the coal account was £8000; and this year it is estimated at £4700, and oil at £2088—together £6788. Last year £141 was derived from the sale of coke; and this year the estimate is £1271. The tar may be worked up; and there will be a great saving in cartages, both of coal into the works and of refuse out. The plant has been erected for less than £1600; but there is a royalty upon the use of the process, which it is estimated will amount to £100 a year. There was an opening ceremony yesterday, at which Lord Provost Dewar turned on the oil to the first set of retorts. The Lord Provost made a short speech, in which he commented upon the enterprise shown by the Commission, in respect that, while the oil gas process was not a year old, they should have it in full working order. Mr. Davidson, late Convener of the Works Committee, said he expected even better results from the working of the process than the Manager and he had made out on paper. For one thing, not a pound of shale coal would now be required in the works.

The Oban Gas Company have fitted up plant for the Alexander-Patterson process in their works. Regarding its introduction, it is explained that Mr. John Stuart MacCaig paid a visit to an exhibition in Glasgow, and at once saw the superiority of the process over other systems; and that he then pressed for its adoption in Oban.

The Linlithgow Gas Company have introduced a third form of oil-gas plant, the inventor of which is Mr. John Laing, of Edinburgh. Mr. Laing's system was adopted, it is stated, after consideration by the Directors of the various processes brought under their notice.† Mr. Laing is well acquainted with the process of the destructive distillation of oil. In 1891, he was awarded a Keith silver medal by the Royal Scottish Society of Arts for a paper on the subject, in which he showed that oil could be decomposed by three methods—by continued and repeated distillation into itself; by radiant heat; and by distillation under pressure. It is said that the plant which has been fitted up in the Linlithgow Gas-Works combines all these three methods.

* This report will be found elsewhere.—Ed. J.G.L.

† An illustration of the plant here referred to appears in our "Register of Patents" to-day.—Ed. J. G. L.

A description of it states that it consists of a welded steel boiler-still, 8 feet long by 30 inches in diameter. This still is charged with a quantity of oil consistent with the number of cubic feet of gas it is desired to be made. The surplus heat from the coal-retorts vaporizes the oil in the still; and these vapours pass into a condenser coil of piping above the roof, and the heavier portion condenses and returns immediately to the still for re-distillation. The lighter or less condensable gases pass over from the condenser-coil and down into a superheater, which is also heated by the surplus heat from the coal-retort; and there the gas is further decomposed and rendered permanent. It is then in a condition to be mixed with the coal gas in the holders, ready for distribution to the consumers.

Mr. T. Douglas Hall, of Montrose, has declined to report on the management of the Forfar Corporation Gas-Works. At a meeting of the Gas Corporation on Tuesday, when this was announced, it was agreed that an inquiry of some sort was necessary, in order to satisfy the townspeople; and it was resolved to ask Mr. Carlow, of Arbroath, to give a report. In the event of Mr. Carlow also declining, Mr. Turner, of Airdrie, is to be asked.

A gale of unusual severity raged in Scotland during last night, doing great damage. About two o'clock this morning, the town of Arbroath was thrown into darkness by the action of the wind upon a gasholder. All the street-lamps went out, and were not re-lighted. Being at the dead of night, there was little inconvenience to the community. At Carnoustie, the chimney-stack of the gas-works was blown down, and in its fall did considerable damage to the retort-house. The consequence was that the gas supply to the town was interrupted.

The membership of the Dundee Gas Commission has been completed for the year, by the election of representatives from the outside bodies who are entitled to send members to it. The Guilding elected their four representatives on Monday, and engaged in some conversation about the proposed change in the Commission. It was generally agreed that the present system of indirect representation is not commendable, particularly when it is remembered that the Gas Commission have power to impose a rate upon the community. This, it is considered, is a power which only the Town Council should possess. Nothing was done; but it is evident the subject is ripening for action in the direction suggested by the Town Council.

One of those sporadic outbreaks regarding quality of gas and the like, which occasionally occur in town councils, took place in Portobello last Monday. The instigator, a Mr. Kellock, brought out the usual arguments about the gas being bad and overcharged; and he moved for the appointment of a Committee to inquire into the matter of public lighting, and all available sources of supply. These sources, he said, were either electricity or Edinburgh gas. In regard to the latter, it may be stated that the burgh of Portobello is excluded from the area of supply of the Edinburgh and Leith Gas Commission; and so it is out of the question. Provost Wood combated the statement about the gas being bad, and pointed out that it was of 26 or 27 candle power—being better gas than is supplied in Edinburgh. The appointment of a Committee was agreed to.

The subject of the repair of the tunnel at the Brechin Gas-Works, which was damaged by flooding, came before the Brechin Police Commission on Monday. It was reported that the Gas Company had offered to contribute £250 to the cost of the repair; and that they were prepared, in the event of being relieved from liability in future, to contribute one-half of the whole cost, which is estimated at between £600 and £700. The Commission resolved to try to come to terms with the Company rather than to prepare for litigation.

Professor John Ferguson, in opening the winter session of the Philosophical Society of Glasgow lately, said that "even now all that could be said was that people accepted scientific truths, not because they could check their accuracy or otherwise estimate their value, but because they could appreciate the practical results to which they led. Without such, scientific truths were of no interest to them. Of all the thousands perambulating Sauchiehall Street that night, how few, he asked, cared what the electric light was, so long as it enabled them to see their way? How few knew of the long years of painful research it had taken to perfect the light; and how few could criticize or pass an opinion that would be worth listening to as regarded how any part of the complex arrangements could be improved in any way? It was the very small number who had to take upon their shoulders the ignorance of the many." From one point of view, this is scientific drivel, because the ordinary individual would but waste his time were he to busy himself trying to understand the scientific principles which underlie all the phenomena that come within the range of his vision. But the speaker, though perhaps he did not intend it, in selecting electric lighting as his illustration uttered a great truth, as everyone must be aware of who observes, week by week, how the ignorance of the many municipal councillors is made to kneel before the scientific knowledge of the few who profess to be educated in the mysteries of electric lighting. I imagine that if, in this matter, there was less ignorance among the many, the "educated few" would have a lighter burden to bear.

The Water Supply of Horbury.—The Horbury Local Board have accepted an offer of the Soothill Upper Local Board to supply water in bulk for thirty years, on the following terms: The minimum daily quantity to be supplied and paid for is 90,000 gallons; and the maximum, 200,000 gallons—the price to be paid being 8d. per 1000 gallons for 90,000 gallons daily, and all above that quantity 7d. Soothill Upper is supplied with water jointly with Thornhill by the Halifax Corporation.

The Preston Gas Company's Parliamentary Powers.—The Preston Gas Company have notified their intention of applying for further parliamentary powers. Amongst their principal objects are the extension of the area of supply to include the townships of Brindle and Grimsargh with Brockholes, and the acquisition, by compulsion or agreement, of 25 acres of land for the construction of works. The Company also seek for an extension of their powers for the supply of cooking and heating-stoves, &c., and they also desire provisions enabling them to produce and supply electricity for lighting and other purposes. Additional capital will be sought.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Nov.* 18.

Sulphate of Ammonia.—The improvement is becoming more pronounced; and the advance this week has been somewhat rapid. Spot sulphate is now exceedingly scarce; and, in consequence, intending buyers are forced to bid well up to secure supplies. The lowest for spot parcels is now £13; and as much as £13 10s. has already been realized for January-April contracts. These transactions show increased confidence in the future of the market; and if nevertheless many large consumers still obstinately abstain from covering their requirements, this fact may seriously weigh against them, as it will have the effect of driving prices again beyond a natural level, when they are forced to come in as buyers, probably at the most inopportune moment. The scarcity of offers applies equally to forward business, as it is even now difficult to find makers who will sell; and there is little doubt that a large portion of the future production is already disposed of. Nitrate is rather easier, and is offering at 9s. per cwt.

LONDON, *Nov.* 18.

Tar Products.—The week has been a busy one for most makers, as the advent of colder weather and other causes, has brought about a large demand for fuel, and, therefore, an increased consumption of pitch. Shipments were never before so large at this season of the year as they are at the moment. Quite a little spurt has set in for carbolic acid; and buyers are either short of stocks or are afraid the Tar Products Sales Committee will fix a higher limit, at their next meeting, which is more than likely. The light tar products, excepting benzol, are in good request; but prices, compared with former years, are miserably low. Business noted during the week is as follows: Tar, 15s. to 16s. Pitch, 26s. to 27s. Benzol, 50's, 1s. 7d.; 90's, 1s. 6d. Creosote, 2d. Creosote salts, 25s. Solvent naphtha, 1s. 2½d. Toluol, 1s. 8d. Crude benzol naphtha, 30 per cent., 8½d. Carbolic acid, 60's, 1s. 7d.; crystals, 5¾d. Cresol, 1s. 2d. Anthracene, 30 per cent., "A," 1s. 2d.; "B," 10d.

Sulphate of Ammonia.—There is a considerable amount of competition among buyers for sulphate. It looks as if the recent apparent cessation of buying was due to some speculative operations of dealers, who are now rushing in to cover themselves. Large business has been done at prices ranging between £12 10s. and £13, less 3½ per cent.; while crude gas liquor is quoted at 7s. 6d. to 9s.

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—The settlement of the coal dispute at the joint conference in London on Friday, has come as an immense relief not only to the coalowners and miners but to all users of fuel, whether for manufacturing or domestic purposes. Following upon the failure of the previous joint conference, the position was daily becoming increasingly serious; and many mills and works were finding it almost impossible to obtain even day-to-day supplies. Gas-works in many cases were on the point of almost complete stoppage; and household consumers were in a large number of instances unable to obtain even the smallest supplies. The settlement has removed any real anxiety with regard to future supplies; but for the moment the position is not very materially improved. With the protracted stoppage, many of the pits will have got into a bad condition as to roadways and the working places of the miners; and it will probably be well into the present week before anything like a full start can be made in the actual getting of coal. In the meantime, users will be largely dependent upon supplies coming in from outside districts; and although there is a good deal of hanging back from buying further at the present high prices, there is not as yet any appreciable giving way. During the past week, all sorts of prices have been ruling, to get hold of immediate supplies. The better qualities of round coal, delivered at stations, has not been obtainable under 27s. 6d. to 30s.; other descriptions of screened coal, suitable for either forge or gas-making purposes, have averaged about 25s.; whilst engine fuel has realized 20s. to 21s. per ton. Upon these excessive special prices, there will no doubt be some immediate giving way; but anything like a return to the rates ruling prior to the stoppage is not at all probable for some weeks to come. The leading main colliery concerns for the present make no change upon their quoted delivered rates. Except that deliveries under contracts will necessarily have to be resumed, buyers in the open market will, for the next month or so, at least, have to pay what may be regarded as exceptionally high prices.

Northern Coal Trade.—The coal trade of the North-east is at the present moment rather disorganized. The very heavy demands from the Midlands still continue to be met; but the negotiations that were in progress at the time of writing stopped all future sales at anything like the current prices, and made buyers hold aloof pending new developments. The settlement of the strike in the Midlands will, of course, speedily cause the present abnormal prices to fall; and thus buyers naturally wished to hold as little of the dear-bought coal as they could. Hence, too, the prices were moving rapidly with the rumours and expectations of the issue. Best Northumbrian steam coal was last week quoted as high as £1 per ton, but now sellers ask about 15s. 6d. per ton f.o.b.; second-class coal being about 1s. to 1s. 6d. per ton lower. There is still a very good demand for small steam coal, all stocks having been cleared away for some time; and the price may be now put at about 7s. per ton f.o.b. The steam coal collieries are working fully; and in a few instances they have tolerably fair orders ahead. Gas coal is in strong demand, both for companies on old contracts and for prompt supplies. The contracts are being worked out at prices that are about 6s. per ton f.o.b. on the average; but for uncontracted coal, as much as 13s. has been paid for small lots, to keep gas-works going. There is still a good demand for manufacturing coal; but there is little alteration in its price. Less is doing in coke just now. Blast-furnace coke is not so profitable as the sale of the uncoked coal at present prices; and thus there has been less made, whilst concurrently four or five furnaces in the North have been laid idle. Coke exports are steady; and for best Durham kinds, the price

is 16s. per ton f.o.b. There is little alteration in the price of gas coke; but the output is now large and is steadily growing.

Scotch Coal Trade.—Circumstances are so much altered by the settlement of the strike in England, that it is impossible to say much about the coal trade in Scotland. The demand for coal for England is very great. It is reported that the Caledonian Railway Company ran over 70 special trains with coal to England on Sunday. Very little coal has been going abroad; and it will now be a question whether, for the remainder of this season, the foreign demand may revive. In Scotland, the men have been making up their minds to demand another advance of 1s. per day; but it is probable they will not now insist on it. With regard to prices, often a purchaser was prepared to pay whatever was asked, according to his extremity; and therefore quotations are scarcely possible. As high as from 11s. to 14s. per ton has been known to be paid at the pithead. Shipments for last week were 197,542 tons—a decrease compared with the preceding week of 21,175 tons, but an increase as compared with the corresponding week of last year of 33,792 tons. For the year to date, the total shipments have been 6,841,527 tons—an increase upon the quantity for the same period of last year of 122,459 tons.

The New Water-Works for Gainsborough.—Yesterday week the Gainsborough Local Board received the sanction of the Local Government Board to negotiate a loan for the purposes of increasing the water supply—viz., £10,000 for the well, repayable in 30 years; £3455 for machinery, &c., repayable in 10 years; and £500 for the purchase of additional land, repayable in 50 years—making a total of £13,955.

Water Supply at the East-End.—At the meeting of the London County Council last Tuesday, a petition was presented from the owners of certain industrial dwellings at the East-end, asking the Council to take steps to have the East London Water Company's Act repealed under which they can refuse to supply water to a height of more than 40 feet from the pavement. Another petition called attention to the fact that a constant supply is not given in the petitioners' district. The petitions were referred to Committees.

The New Water-Works for Bodmin.—The Bodmin Water Company have resolved to issue 500 5 per cent. preference shares of £10 each; the money being required to carry out their new water scheme. The cost of the undertaking is estimated at about £8500, towards which the County Council have agreed to contribute £3500 on completion of the works, in consideration of which the Company will supply, if required, the County Lunatic Asylum with not exceeding 40,000 gallons of water per day (any excess to be paid for at the rate of 1s. per 1000 gallons).

Wenham Company, Limited.—After bringing into account the sum of £595 from last year, the profit and loss account of this Company shows a debit balance of £1887. The Directors in their report state that, while regretting this result, they remain of opinion that the course proposed for the future management of the business, in which the shareholders concurred at the meeting held in December last, was the right one. The modifications and alterations could not, however, come into active operation until February following; and these have, therefore, to only a small extent influenced the figures now presented. The operations of the Company have not only been materially affected by the extreme depression of trade, but have also suffered from the exceptional competition of other systems of lighting. The outstanding debentures of the Company, amounting to £17,500, become due on the 1st prox. To provide for them, the Directors have decided on an issue of 7 per cent. debentures. The report was adopted at the ordinary general meeting of the Company last Friday.

South Barracas (Buenos Ayres) Gas Company, Limited.—The fourth ordinary general meeting of this Company was held last week, at the London offices, under the presidency of Sir W. Brett, K.C.M.G. In moving the adoption of the report and accounts, the Chairman said the meeting was really a formal one, because the dividend was guaranteed by the Buenos Ayres New Gas Company, and had been paid under the agreement. Recent political disturbances had thrown them very much back, and little progress had consequently been made. With regard to the political and social state of the country, he considered that the present Government was better than any that had preceded it. He believed they wished to do what was right; but there was a clique who did not like the new phase of honesty which the Government wished to inaugurate. They had resisted to the utmost, and were dying as hard as they could. He might, however, fairly say that the prospect, politically and socially, was more favourable than it had been for years. The motion was carried unanimously.

Sales of Shares.—Messrs. Edwin Fox and Bousfield sold by auction at the Mart, Tokenhouse Yard, E.C., last Wednesday, an entire freehold adventurer's share in the *New River Company*. The Auctioneer (Mr. Bousfield), in offering the share, stated that they were practically, but not actually, presenting a seat at the Board. The sale of the share would cause a vacancy at the Board; and the buyer would step into it. Four years ago, they sold a similar share for £122,800. There was nothing to prevent them disposing of this one for a larger price, as the reversion was now four years nearer. The bidding commenced at £85,000, and slowly mounted up to £94,900, at which figure it was sold to a representative of the United Kingdom Temperance General Provident Institution. Mr. Bousfield subsequently mentioned that £101,000 had been offered for the share before he came into the room. ——At Salisbury, on the same day, 240 £12 10s. ordinary 5 per cent. shares in the *Salisbury Gas Company* were offered for sale by auction by Messrs. Waters and Rawlence. This is an issue of new capital that is required to meet the cost of a new gasholder and tank now in progress of erection. There was a brisk demand; and the whole of the shares were disposed of in twenty minutes. The following are the prices realized: 22 shares sold at £13 15s.; 128, at £13 17s. 6d.; and 90, at £14 per share. The total sum produced was £3338, which represents a premium of £338 on the nominal value of £3000.——At Brigg last Thursday, Messrs. Spring and Son sold a number of shares in the *Brigg Gas Company* at the following figures: £10 shares, at £19 2s. 6d. and £19; £3 shares, at £5 5s. and £5 2s. 6d.; and £2 shares, at £3 10s. each.

Increases in the Price of Gas.—The Blackpool Gas Committee recently resolved to increase the price of gas from 2s. 6d. to 3s. per 1000 cubic feet; and their action has been approved by the Council. At Burnley and Rochdale, the Gas Committees have decided to recommend the Corporations to advance the price—in the former case by 3d. and 4d., and in the latter by 3d. per 1000 cubic feet.

Supper to the Employees of Messrs. E. Cockey and Sons, Limited.—To commemorate the opening of the new works at Garston, the employees of Messrs. Edward Cockey and Sons, Limited, were entertained to supper by the Company last Thursday evening. The gathering took place in the Auction Mart, Frome; and about 160 sat down, including Directors, officials, and workmen—the latter having the privilege extended to them of bringing their wives or sweethearts. After the meal, a short toast-list was gone through; songs and recitations being given. The chair was taken by Mr. W. A. Padfield (Chairman of the Company); and Mr. E. Tucker was Vice-Chairman. The other Directors present were Messrs. C. Baily, R. Fish, J. Lowe, and H. Perry; also Mr. W. L. Ramsden (General Manager) and Mr. A. J. Rozea (Secretary). The Chairman, at the close of an interesting address, in which he reviewed the progress of the Company, and emphasized the necessity for having premises and plant adequate to the production of good work, and alluded to the great desirability of maintaining cordial relations with those who had to produce it, expressed his pleasure at the completion of the new works, which had, he said, been built from Mr. Ramsden's designs, and were thoroughly well lighted and ventilated, and were such as they should be proud of. Mr. Tucker proposed "The Health of the Chairman," to which Mr. Padfield responded. Mr. Spackman proposed "The Directors," which was acknowledged by Messrs. Fish and Lowe. "The Health of Mr. Ramsden" was very cordially drunk. In responding, he stated that when they were at the old works they turned out about 18 tons of castings per week; whereas now the weight was between 40 and 50 per cent. more, and the foundry was not working to its full capacity. Other toasts followed. The proceedings were thoroughly harmonious from beginning to end; and the happy feeling permeating all showed that employers and employed work cordially together.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For Stock Market Intelligence, see ante, p. 931.)

Issue.	Share	When ex-Dividend.	Dividend or Div. & Bonus.	NAME.	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon investment.
£			p. c.	**GAS COMPANIES.**				£ s. d.
590,000	10	13 Oct.	10½	Alliance & Dublin 10 p. c.	10	16½—17½	..	6 0 0
100,000	10	,,	7½	Do. 7 p. c	10	11½—12½	..	6 0 0
300,000	100	1 July	5	Australian (Sydney) 5 % Deb.	100	102—104	..	4 16 2
100,000	20	31 May	8	Bahia, Limited	20	10½—11½	..	13 18 3
200,000	5	15 Nov.	6½	Bombay, Limited	5	5¼—5⅜*	..	5 13 0
40,000	5	,,	6½	Do. New	4	3¾—4¼*	..	5 13 0
380,000	Stck.	16 Aug.	11½	Brentford Consolidated	100	220—225	..	5 2 2
180,000	,,	,,	8½	Do. New	100	163—168	..	5 1 2
220,000	20	15 Sept	11½	Brighton & Hove Original	20	40—42	..	5 9 6
888,500	Stck.	31 Aug.	5	Bristol	100	102—105	..	4 15 3
320,000	20	29 Sept.	11½	British	20	42—44	..	5 4 7
50,000	10	31 Aug.	11½	Bromley, Ordinary 10 p. c.	10	19—20	..	5 15 0
51,510	10	,,	8½	Do. 7 p. c.	10	15—16	..	5 6 3
328,750	10	28 July	2	Buenos Ayres (New) Limited	10	6—7	..	2 17 2
200,000	100	1 July	6	Do. 6 p. c. Deb.	100	98 -101	+1	5 18 10
150,000	20	13 July	8	Cagliari, Limited	20	27—28	+½	5 14 3
550,000	Stck.	13 Oct.	12½	Commercial, Old Stock	100	244—249	..	5 0 4
165,000	,,	,,	9½	Do. New do.	100	187—192	..	4 19 0
160,762	,,	15 June	4½	Do. 4½ p. c. Deb. do.	100	125—130	..	3 9 3
800,000	Stck.	15 June	13	Continental Union, Limited	100	230—235	..	5 10 7
200,000	,,	,,	10	Do. 7 p. c. Pref.	100	191—196	..	5 2 0
75,000	Stck.	15 Sept.	10	Crystal Palace District	100	285—290	..	5 5 3
486,090	10	28 July	10	European, Limited	10	21—22	..	4 10 1
354,060	10	,,	10	Do. Partly paid	7½	14½—15½	..	4 17 10
5,646,590	Stck.	16 Aug.	12	Gaslight & Coke, A, Ordinary	100	225—230	+5	5 4 4
100,000	,,	,,	4	Do. B, 4 p. c. max.	100	97—102	..	3 18 5
665,000	,,	,,	10	Do. C, D, & E, 10 p.c. Pf.	100	263—268	..	3 14 7
30,000	,,	,,	5	Do. F, 5 p. c. Prf.	100	120—125	..	4 0 0
60,000	,,	,,	7½	Do. G, 7½ p. c. do.	100	185—190	..	3 18 11
1,300,000	,,	,,	7	Do. H, 7 p. c. max	100	173—178	..	3 18 7
463,000	,,	,,	10	Do. J, 10 p. c. Prf.	100	263—268	..	3 14 7
476,000	,,	,,	6	Do. K, 6 p. c. Prf.	100	157—162	..	3 14 1
1,061,150	,,	15 June	4	Do. 4 p. c. Deb. Stk.	100	127—130	..	3 1 6
294,850	,,	,,	4½	Do. 4½ p. c. do.	100	132—137	..	3 5 8
908,000	,,	,,	6	Do. 6 p. c. do	100	175—180	..	3 6 8
3,800,000	Stck.	15 Nov.	12	Imperial Continental	100	210-215*	−2	5 11 7
75,000	5	15 June	6	Malta & Mediterranean, Ltd.	5	5—5½	..	5 9 1
560,000	100	2 Oct.	5	Met. of Melbourne, 5p. c. Deb.	100	105—107	..	4 13 5
541,920	20	15 Nov.	5	Monte Video, Limited	20	12¼—13¼*	..	7 8 2
150,000	5	31 May	8†	Oriental, Limited	5	7¼—7¾	..	5 9 0
60,000	5	29 Sept.	7	Ottoman, Limited	5	4—4½	..	7 15 6
166,870	10	—	2	Pará Limited	10	1½—2	..	—
				People's Gas of Chicago—				
420,000	100	2 Nov.	6	1st Mtg. Bds.	100	98—102	..	5 17 8
500,000	100	1 June	6	2nd Do.	100	98—102	..	5 17 8
150,000	10	13 Oct.	5	San Paulo, Limited	10	8½—9½	..	5 5 3
500,000	Stck.	31 Aug.	15½	South Metropolitan, A Stock	100	302—307	..	5 0 11
1,350,000	,,	,,	12	Do. B do.	100	242—247	−1	4 17 2
260,000	,,	,,	13	Do. C do.	100	255—260	−3	5 0 0
750,000	,,	13 July	5	Do. 5 p. c. Deb. Stk.	100	148—152	..	3 5 9
60,000	Stck.	31 Aug.	11½	Tottenham & Edm'nton, "A"	100	210—215	..	5 7 9
				WATER COMPANIES.				
744,897	Stck.	29 June	10	Chelsea, Ordinary	100	270—275	..	3 12 9
1,720,252	Stck.	13 Oct.	8	East London, Ordinary	100	210—215	−2	3 14 6
544,440	,,	29 June	4½	Do. 4½ p. c. Deb. Stk.	100	140—143	..	3 2 11
700,000	50	15 June	8½	Grand Junction	50	113—117	..	3 12 6
708,000	Stck.	16 Aug.	11	Kent	100	284—289	..	3 16 1
1,043,800	100	29 June	9½	Lambeth, 10 p. c. max.	100	242—247	−1½	3 16 11
406,200	100	,,	7½	Do. 7½ p. c. max.	100	199—204	..	3 13 6
310,000	Stck.	29 Sept.	4	Do. 4 p. c. Deb. Stk.	100	128—131	..	3 1 0
500,000	100	16 Aug.	12½	New River, New Shares	100	335—340	..	3 11 4
1,000,000	Stck.	28 July	4	Do. 4 p. c. Deb. Stk	100	132—135	..	2 19 3
902,300	Stck.	15 June	6	S'thwk & V'xhall, 10 p. c. max.	100	155—160	..	3 15 0
126,500	100	,,	6	Do. D 7½ p. c. do.	100	145—150	..	4 0 0
1,155,066	Stck.	15 June	10	West Middlesex	100	262—267	..	3 14 10

*Ex Div

† Next dividend will be at this rate.

The Local Government Board and the Water Supply of Frodsham.—The members of the Runcorn Rural Sanitary Authority were informed last Tuesday that the Local Government Board had sanctioned the borrowing of £3800 for water-supply works for Frodsham. Mr. Williams stated that they had at last received the long-desired reply from the authorities in London. While the Government had been urging them to execute public works to furnish labour for the unemployed, the Department had perpetually held them back. It was two years since they were approached on the present scheme; and five months had elapsed since an Inspector had held an inquiry. Many efforts had since been made to get the required sanction; but only that morning had it come to hand. During the past summer, the inhabitants had suffered from a scarcity of water, and what they used was condemned by every medical man, both as to quantity and quality. They had had epidemics constantly for many months; and now it would be Christmas before practical operations in connection with the scheme could be commenced. Several members expressed agreement in the condemnation of long delays by the Local Government Board.

Ipswich Corporation Water Supply.—The report on the first year's operations of the Ipswich Water-Works under the Corporation was presented at the meeting of that body last Thursday week; but the necessity of bringing all the Corporation accounts into harmony as to date prevented a financial statement being made until the financial year is completed on March 31 next. The report stated that a fairly complete inspection of the town as regarded the water supply had been made, which showed that, out of 13,057 houses and business places visited, 12,197 were supplied from the Corporation water-mains, and 861 from independent sources. Of these 12,197 houses, &c., 6861 obtained their water from the high-service reservoirs and 5336 from the low-service reservoir. During the year, 311 additional supplies were laid. The new supply scheme, estimated to cost about £2500, which received the sanction of the Corporation in May last, had been completed at a cost of £2202, and was giving general satisfaction. The water pumped into the reservoirs during the year was approximately 259,040,000 gallons, at a cost for fuel of £657. The Committee also remarked that they were fortunate in having secured the services of Mr. Roberts as Manager and Engineer; and they recommended that his salary be increased to £200 a year. The report was adopted on the motion of the Chairman of the Committee (Mr. D. Ford Goddard).

Konigsberg Water Supply.—The water-works at Königsberg are to be greatly extended; and the municipal authorities have voted a sum of £30,000 for the purpose.

The Costs of the Stonehouse Water Bill.—The costs connected with the promotion of the Stonehouse Local Board Water Bill and the opposition of that authority to the Plymouth Water Bill amounted to £7065.

Darwen Gas and Water Annuities.—Mr. E. P. Burd, one of the Inspectors of the Local Government Board, recently held an inquiry at Darwen in regard to an application by the Corporation for power to provide sinking funds for the redemption of the gas and water works annuities and mortgages. They also asked for power to borrow from time to time for the purpose of redeeming these annuities. No opposition was offered to the proposal.

Population and Water Supply.—Mr. J. A. Picton, of Leicester, has placed on the paper of the House of Commons a notice of his intention to move this evening for a return from the year 1861 to 1892, both inclusive, from the boroughs or towns of Birkenhead, Birmingham, Blackburn, Bolton, Bradford, Brighton, Bristol, Burnley, Bath, Barrow-in-Furness, Ashton-under-Lyne, Cardiff, Croydon, Chatham, Cheltenham, Carlisle, Dewsbury, Derby, Durham, Devonport, Dover, Coventry, Gateshead, Halifax, Huddersfield, Hull, Hanley, Leeds, Leicester, Liverpool, London, Lincoln, Manchester, Middlesbrough, Newcastle-on-Tyne, Norwich, Nottingham, Ipswich, Oldham, Plymouth, Portsmouth, Preston, Reading, Rochdale, Stockport, Salford, Sheffield, Sunderland, Swansea, St. Helens, Stoke-upon-Trent, Wakefield, Walsall, Warrington, West Ham, Wolverhampton, Southampton, York, Edinburgh, Glasgow, Dundee, Dublin, and Belfast, of the population in the years of the Census, and of the estimated populations in each year of the above period upon which the annual death-rate per 1000 was based, also the death-rate per 1000 for each year; a copy of the chemical analysis of the water supplied to each place (London excepted), and, if the sources of supply have been added to, changed, or brought from new quarters, an analysis of each and all, together with the length of time each has been in use, and the daily supply from each and every source in 1892; and a statement of the nature of the source of supply—whether gathering-grounds, rivers, lakes, coal measures, wells in the new red sandstone, springs, or otherwise.

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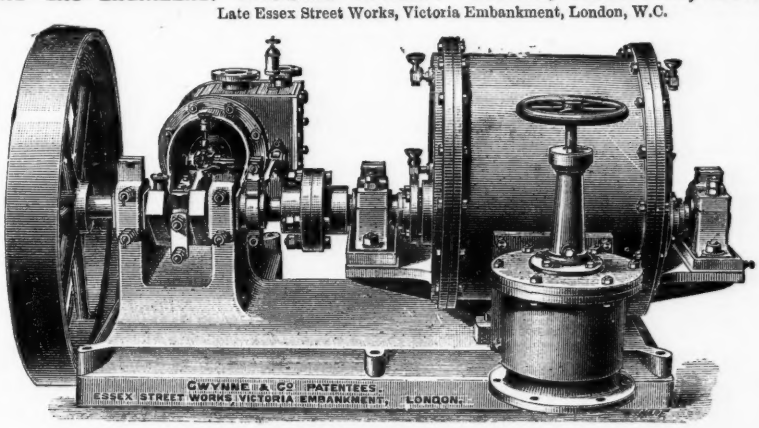
The result is that in very instance their work is giving the fullest satisfaction.

They have completed Exhausters to the extent of 30,000,000 cubic feet passed per hour, which are giving unqualified satisfaction in work, and can be referred to.



Engine and Exhauster Combined on One Bed-Plate.

GWYNNE & Co.'s Exhausters are constructed of large size to pass the required quantity of Gas at very slow speeds; the wear and tear being reduced to a Minimum.

Catalogues and Testimonials sent on Application.

Their Exhausters can be made, when desired, on their New Patent Principle, to pass Gas without the slightest oscillation or variation in pressure.

NO OTHER MAKER CAN DO THIS.

Makers of GAS-VALVES, HYDRAULIC REGULATORS, VACUUM GOVERNORS, STEAM-PUMPS for Tar, Liquor, or Water; PATENT SELF SEALING AND CLEANSING RETORT-LIDS AND MOUTHPIECES; CENTRIFUGAL PUMPS and PUMPING ENGINES specially adapted for Water-Works, raising Sewage, &c.

Also GIRARD and other TURBINES, HIGH-SPEED ENGINES, DYNAMOS, &c., &c., for ELECTRIC LIGHTING.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale in the United Kingdom than all other Oxides combined. Purity and uniformity of quality guaranteed. Pamphlet, "How to Purchase Bog Ore," to be obtained on application.
Gas Purification and Chemical Company, Limited, Palmerston Buildings, Old Broad Street, London, E.C.
JOHN WM. O'NEILL, Managing Director.

GAS PURIFICATION AND CHEMICAL COMPANY, LIMITED.

ANDREW STEPHENSON, Agent.
Please address all communications to the Company, as above.

ANDREW STEPHENSON, Agent for BRIN'S OXYGEN COMPANY, Limited, Westminster, S.W.
City Address: 182, Gresham House, Old Broad Street, LONDON, E.C.

VOLCANIC Fire Cement (Winkelmann's)
Fire Resistance 4500° Fahr.
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JAMES LAWRIE & CO. supply Best SCOTCH CANNEL COALS, Best FIRE-CLAY RETORTS, BRICKS, TILES, and LUMPS; BOILER SEATING BLOCKS, FLUE COVERS, and SILICA BRICKS for SPECIAL FURNACE WORK; COKE BARROWS, BOGIES, and SMALL WAGONS.
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W. C. HOLMES & Co., Huddersfield; AND 80, CANNON STREET, LONDON, Contractors for Gas-Works complete, Makers of Gasholders, Purifiers, Scrubbers, Condensers, Retort Fittings, &c., Improved Valves, Engines, and Exhausters. Also for Collingwood's Regenerative Retort-Settings.
*** See Advertisement p. II., centre of JOURNAL.
Cablegrams: "Ignitor London." Telegrams: "Holmes Huddersfield."

J. & J. BRADDOCK, Globe Meter Works, Oldham.
First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.
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BALE & CO., direct Importers from Ireland. Sample and Price on application.
OXIDE PAINT, SULPHURIC ACID, & Chemicals.
120 and 121, NEWGATE STREET, LONDON, E.C.
Telegrams: "BOGORE, LONDON."

OXIDE OF IRON.

FINEST Quality of Natural Bog Ore.
Particulars and price, apply to Mr. T. L. ARCHER, 20, Fennel Street, MANCHESTER.

MESSRS. DEBENHAM, TEWSON, FARMER, and BRIDGEWATER'S MONTHLY LIST of Shops, Show-Rooms, Factories, and Waterside Premises, suitable for the Exhibition and Manufacture of Engineering and other Appliances, may be obtained, free of charge, at their Offices, 80, CHEAPSIDE, E.C.

LIQUOR, Tar, and Spent Oxide wanted.
BROTHERTON AND Co., Ammonia and Tar Distillers, BIRMINGHAM, LEEDS, and WAKEFIELD.

NOTICE TO ADVERTISERS.—COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office *not later* than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of PERMANENT ADVERTISEMENTS should be received not later than the FIRST POST on SATURDAY.

CANNEL COAL, ETC.

JOHN ROMANS & SON, EDINBURGH. Gas Engineers, supply all the most approved SCOTTISH CANNELS; also FIRE-CLAY GOODS, CAST-IRON PIPES, and other APPARATUS for GAS AND WATER WORKS.

Prices, &c., will be forwarded on application to No. 83, ST. ANDREW SQUARE, EDINBURGH, } SCOTLAND.
NEWTON GRANGE, NEAR DALKEITH, }

GOLD MEDAL, 1892.

TUBES and Fittings for Gas, Steam, and Water, in stock to 8 inches diameter; Iron and Steel Ascension-Pipes.

JOHN SPENCER, Globe Tube Works, WEDNESBURY; and 14, Great St. Thomas Apostle, LONDON.

JOHN RILEY & SONS, Chemical Manufacturers, Hapton, near Accrington, are MAKERS of SULPHURIC ACID, from Brimstone, for Sulphate of Ammonia making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol. References given to Gas Companies.

CHARTERING, FORWARDING, AND INSURANCE.

ROBERT BRUCE FITZMAURICE, 29, Great St. Helens, London, Shipping Agent to several Gas Companies and Plant Manufacturers, would be glad to UNDERTAKE LARGE or SMALL SHIPMENTS to any Port.

HUTCHINSON BROTHERS, Gas Engineers, &c., Falcon Works, Barnsley, Makers of Wet and Dry Gas-Meters, Brass-Work, and general Gas Apparatus, Lead Saturators, Tanks, &c., Tools, and Gas-Works sundries. (See last week, p. 877).

Telegrams: "HUTCHINSON BROS., BARNSLEY."

PLUMBER and Gas and Hot Water Fitter wants a constant Situation. Good References.

Address W. HAYER, 37, Arlington Road, SURBITON.

YOUNG Man (age 23) seeks Situation as CLERK or COLLECTOR in a Gas Company. Six years' experience. Highest references.

Address No. 2302, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Situation as Working Gas Manager, used to Engine and Exhauster. Can use all Tar made for firing Retorts, lay Mains and Services, fix Meters, take Indices, and do his own Mechanical Repairs upon the Works.

Address No. 2303, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, by a young Man (age 23), a Situation as ASSISTANT in a medium-sized Gas-Works. Five years' experience in modern Works (Regenerator Furnaces). Well up in Photometer work and Testing of every kind. Honours in Advanced Grade, City and Guilds of London Examination in Gas Manufacture.

Address No. 2301, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

TO GAS ENGINEERS AND MANAGERS.

ADVERTISER desires a Situation as WORKING FOREMAN. Has had considerable experience in Constructing, Erecting, and Supervision; and thoroughly understands the routine of Gas-Works throughout. Has acquired thorough knowledge of the most modern methods in Carbonizing, Gas Purification, and Distribution.

References and testimonials forwarded on application, by letter, to No. 2300, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

SLAITHWAITE GAS COMPANY, NEAR HUDDERSFIELD.

WANTED, a steady young Man as METER INSPECTOR and FITTER. Must be able to repair and test Meters.

Apply, stating age, wages, &c., not later than Monday, Nov. 27, to JNO. FURNISS, Secretary and Manager.

ST. AUSTELL GAS-WORKS.

WANTED, a Man who thoroughly understands the making of Gas, Sulphate of Ammonia, and the General Management of a Gas-Works, as MANAGER of the above Works. The Manager would have to keep the Accounts, and collect the Gas and Meter Rents. House, Gas, Fuel, and Rates and Taxes provided and paid by the Company.

Applications, stating experience and former occupation, with salary required, to be sent to R. G. LAKES, Esq., Trevarrick, St. Austell, CORNWALL, on or before Saturday, Dec. 2 next.

Nov. 1, 1893.

WANTED, a second-hand Crossley "OTTO" 1-HORSE GAS-ENGINE; also a ROTARY EXHAUSTER (capacity, 3000 cubic feet per hour), with the necessary Inlet and Outlet Connections, Bye-Pass Valves, and Governor complete. The whole must be in first-rate working order.

Particulars, with lowest price, to Mr. COWNEY, Gas-Works, Seaford, SUSSEX.

TO INVENTORS AND OTHERS.

PATENTS for Inventions Secured and TRADE MARKS REGISTERED throughout the World. Advice on all matters connected with the above. Handbook gratis on application.

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CORPORATION OF NOTTINGHAM.

ENGINEER TO WATER UNDERTAKING.

THE Water Committee of the Corporation of Nottingham require the services of a Practical and Experienced ENGINEER, to transact and conduct the whole of the Engineering, Distribution, and other Works of, or in connection with, their Water Undertaking.

He will be required to reside within the Borough, and will not be permitted to engage in any other employment or take pupils, or be entitled to any Commission or Fees.

The Committee will find the Offices and Staff, and other outgoings, including Travelling Expenses.

Three months' notice on either side to terminate the engagement.

The Salary has been fixed by the Committee at £600 per annum.

Applications, with copies of testimonials only, to be addressed and sent to me on or before Thursday, the 7th day of December next. Canvassing is prohibited.

By order of the Committee,
SAMUEL G. JOHNSON,
Town Clerk.

Guildhall, Nottingham,
November, 1893.

TO BE SOLD—A Station Meter, in Good Working Condition, with Clock, Tell-Tale, Bye-Pass Valve, 6-inch Connections, and two Cup Valves, at the Elsecar Gas-Works, Barnsley. Price £40 net.

MIDLAND RAILWAY COMPANY.

THE Directors of the Midland Railway Company are prepared to receive TENDERS for the purchase of the surplus HYDROCARBON and OIL-GAS TAR produced at their Oil-Gas Works, Kentish Town (London), Bristol, Birmingham, Leeds, and Manningham during 1894.

Forms of Tender (for consideration on Dec. 14, 1893) may be had on application to Mr. PETTIFOR, General Stores Department, Midland Railway, DERBY.

LLANDUDNO IMPROVEMENT COMMISSIONERS.

TENDERS FOR GAS COAL.

TENDERS are invited for the supply of GAS COAL, in quantities ranging from 500 to 1000 tons, capable of producing a minimum of 9500 cubic feet of 17-candle Gas, to be delivered (carriage paid) at the Llandudno Station, in quantities of not less than three trucks per day until the whole is delivered, and free from any Strike Clause.

The Commissioners do not undertake to accept the lowest or any tender.

Tenders, endorsed "Tender for Coal," to be sent in to me not later than the 25th inst.

A. CONOLLY,
Clerk to the Commissioners.

Nov. 15, 1893.

LEA BRIDGE DISTRICT GAS COMPANY.

BY ORDER OF THE DIRECTORS.

Sale of 300 £10 Shares, part of the further additional Share Capital authorized by the Lea Bridge Gas Act, 1878, and ranking for a Dividend of 7 per cent. per annum, with increase or decrease under the usual Parliamentary Sliding-Scale Clauses.

MR. ALFRED RICHARDS will sell the above BY AUCTION at the Mart, E.C., on Wednesday, Dec. 6, 1893, at One for Two precisely, in lots.

Particulars may be obtained at the COMPANY'S OFFICES, 3, Jeffrey's Square, ST. MARY AXE, E.C., and of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

BROMLEY GAS CONSUMERS' COMPANY.

SALE BY TENDER OF £3500 FOUR PER CENT. MORTGAGE DEBENTURES

In sums of £100 or multiples thereof, to be issued the 31st of December, 1893, and paid off at par on the 31st of December, 1903. Minimum price, at the rate of £105 per cent. of the amount of each Debenture.

THE Directors invite Tenders for the above-mentioned MORTGAGE DEBENTURES, to be sent to me before Eleven o'clock on the Morning of Thursday, the 14th of December, 1893.

All tenders must be made in the form provided by the Company, which, together with printed Particulars and Conditions of Tender, can be obtained on application to me at the Company's Offices, Homesdale Road, Bromley, Kent.

By order,
HENRY W. AMOS,
Secretary.

Nov. 14, 1893.

SULPHURIC ACID.

JOHN NICHOLSON & SONS, Chemical Works, LEEDS, specially produce this ACID from BRIMSTONE, for making SULPHATE OF AMMONIA of high quality and *good* colour. Delivery in our own Railway Tank-Wagons or Carboys. Highest references and all particulars supplied on application.

SADLER AND CO., LIMITED, MIDDLESBROUGH; ULVERSTON (BARROW); PORTSMOUTH; CARLTON; STOCKTON; 315, St. Vincent Street, GLASGOW; and 85, Water Street, NEW YORK. Tar Distillers, Manufacturers of all TAR PRODUCTS, ALIZARINE and other TAR COLOURS, BICHROMES, OXALIC ACID, ALKALIES, LIQUOR AMMONIA, AMMONIA SULPHATE, &c.

Head Office: MIDDLESBROUGH. Correspondence invited.

PORTER & CO., Gowts Bridge Works, LINCOLN, Engineers, Ironfounders, and Contractors, for the erection of Gas-Works for Towns, Villages Mansions, Manufactories, Collieries, and Isolated Buildings, at home and abroad. Manufacturers of Retorts and Fittings, Condensers, Scrubbers, Purifiers, Valves, &c.; also of Girders, Wrought and Cast Iron Tanks, Iron Roofs, &c.

Telegraphic Address: "PORTER, LINCOLN."

G. L. LAMBERT, 26, Alberta Terrace, Nottingham. Consultations, Advice, Reports in Various Branches of **Practical** Mechanical Engineering and Machinery. **Specialities** in Water, Sewage, and Gas Plant Making. **Surveyor** of Steam-Ships, Marine Engines, Boilers, and General Machinery. **Detailed Inspection** of Engineering Contracts during Manufacturing and Erection.

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AN ASSOC.M.INST.C.E. having an extensive experience in GAS and WATER WORKS' DESIGN and ERECTION, now Chief Assistant in a large Gas-Works and Engineer to several small ones, having designed and erected a THREE HUNDRED and a ONE HUNDRED MILLION GAS-WORKS complete, besides several small ones, also ENLARGED many other Works, including NEW LIFTS to EXISTING GASHOLDERS, REGENERATIVE SETTINGS, &c., would be pleased to VISIT WORKS and ADVISE on their EXTENSION or ALTERATION, making SPECIFICATIONS, DRAWINGS, ESTIMATES, and superintend erection if desired.

SPECIALITIES.

Any EXTENSION or ALTERATION to GAS or WATER WORKS. ASSESSMENT of Gas-Works. New HOLDERS, TANKS, ROOFS, PURIFIERS, or FILTER-BEDS. TELESCOPING or adding FRESH LIFTS to EXISTING HOLDERS. REGENERATIVE SETTINGS, for SMALL GAS-WORKS, without Excavations. SAVING 20 PER CENT. in first cost, renewals, and working.

Address "Boz," 9, Gracechurch Street, LONDON, E.C.

CROYDON COMMERCIAL GAS AND COKE COMPANY.

SALE BY TENDER OF £8500 FOUR PER CENT. MORTGAGE DEBENTURES.

In sums of £100 or multiples thereof, to be issued the 1st of January, 1894, and redeemed or paid off at par on the 1st of January, 1904. Minimum Price, at the rate of £103 per cent. of the amount of each Debenture.

THE Directors invite Tenders for the above-mentioned MORTGAGE DEBENTURES, to be sent to me on or before Tuesday, to 28th of November, 1893.

Printed Particulars and Conditions of Tender can be obtained at the Offices of the Company, Katharine Street, Croydon.

WILLIAM J. RUSSELL,
Secretary.

EAST LONDON WATER-WORKS COMPANY.

ISSUE OF NEW CAPITAL.

NOTICE is hereby given, that the Directors are prepared to receive TENDERS for £35,000, being the sixth and final portion of the NEW PERPETUAL DEBENTURE STOCK of the Company, to bear Interest at 4½ per cent. per annum, free of Income-Tax, such Tenders to be delivered at the Company's Offices, St. Helen's Place, in the City of London, not later than Eleven o'clock, a.m., on the 14th day of December, 1893, and payment of accepted Tenders made on the 22nd of December.

Particulars and Conditions, together with Form of Tender, may be obtained at the said Offices, or will be forwarded on application.

By order of the Court of Directors,
ISAAC ADOLPHUS CROOKENDEN,
Secretary.

St. Helen's Place, London,
Nov. 4, 1893.

Fcap. 4to, Cloth, price 7s. 6d., post free.

Practical Photometry.

By William Joseph Dibdin, F.I.C., F.C.S.,

London: WALTER KING, 11, Bolt Court, FLEET ST., E.C.

WILLIAM LIVESEY TESTIMONIAL FUND.

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FINAL LIST OF SUBSCRIPTIONS.

	£	s.	d.
Amount previously reported	537	18	0
Allan, John, *Gas World*	3	5	0
Anderson, George	5	5	0
Barnet District Gas and Water Company	5	5	0
Blyth, E. K.	2	2	0
Chesterfield Water-Works and Gaslight Company	2	2	0
Clarke, D.	1	1	0
Dorchester Gas and Coke Company	3	3	0
Dorking Gas Company	2	2	0
Eastbourne Gas Company	5	5	0
Forbes, Abbott, and Lennard	5	5	0
Harrogate Gas Company	2	2	0
Kettering Gas Company	5	5	0
Lea Bridge District Gas Company	5	5	0
Linging, F. L. (Special)	45	0	0
Linging, F. E.	5	5	0
Luton Gas Company	5	5	0
Maidstone Gas Company	5	5	0
Merthyr Tydfil Gas Company	5	5	0
Poole Gas and Coke Company	5	5	0
Romford Gas Company	4	4	0
Sellers, Charles	2	2	0
Sheffield United Gaslight Company	10	10	0
Swansea Gaslight Company	12	12	0
Taplay, H.	1	1	0
Thomas, Hanbury	2	2	0
Torquay Gas Company	5	5	0
Wadeson, James	1	1	0
Wake, W.	2	2	0
	£697	9	0

Now Ready, Price 6s., Cloth Bound,

THE CHEMISTRY OF ILLUMINATING GAS,

By

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This work contains chapters on: The Relative Cost of Light from Gas, Oil, and Candles; Products of Combustion; The Sulphur Question; The Composition of Illuminating Gas; Water Gas; Various Gas-Making Processes; Oil Gas; Properties of Fluid Hydrocarbons; Tar for Gas Making; Destructive Distillation; Condensation; and Purification.

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Chelsea, East London, Grand Junction, Kent, Lambeth, New River, Southwark and Vauxhall, and West Middlesex—showing the Capital, Income, Expenditure, Profits, and Dividends per Million and per Thousand Gallons of Water supplied; the proportion of Expenditure and Profits to gross Income; and the Income, Expenditure, and Profits per House, &c., supplied for the year ended December 31, 1892, or March 31, 1893, together with the quantity of Water supplied, the estimated daily quantity supplied for domestic and other purposes, the quantity supplied per head of population, &c., &c., for the year ended December 31, 1892.

Compiled and arranged by

ALFRED LASS, F.C.A.

LONDON:

WALTER KING, 11, Bolt Court, FLEET STREET, E.C.

ROBERT MARSHALL,
CANNEL COAL MERCHANT,
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Prices and Analysis of all the Scotch Cannels on application.

HEBBURN MAIN GAS COALS.

Yield of Gas per ton . . . . . 10,500 cubic feet.
Illuminating Power . . . . . 16·4 candles.
Coke . . . . . 68 per cent.

For prices, f.o.b. Ship or Delivered by Rail, apply to

THE WALLSEND & HEBBURN COAL COMPANY, LTD.
B Lombard Street,
NEWCASTLE-ON-TYNE.

W. RICHARDSON, Fitter.

LONDONDERRY GAS COALS

FROM THE

MARQUIS OF LONDONDERRY'S COLLIERIES,

COUNTY OF DURHAM.

Available output up to 5000 tons per day.
Yield of Gas 11,000 cubic feet per ton of Coal as per analysis by Mr. John Pattinson, F.C.S., F.I.S.

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S. J. DITCHFIELD,
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JAMES OAKES & Co.,

ALFRETON IRON-WORKS, DERBYSHIRE,
AND
Wenlock Iron Wharf, 21 & 22, Wharf Road, CITY ROAD, LONDON, N.

Manufacture and keep in Stock at their Works (also large stock in London)

PIPES and CONNECTIONS, 1¼ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with bolts, nuts, and covers, and rendering leakage impossible.

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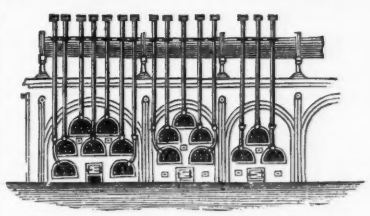

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FIRE-CLAY & BRICK WORKS,

STOURBRIDGE.

Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS TILES, and every description of FIRE-BRICKS.

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BEST GLASSHOUSE POT & CRUCIBLE CLAY.

SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

For **FIRE-BRICKS,** the most durable for **GAS-FURNACES,**

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UNEQUALLED.

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BLACK BED GAS COAL.

Prices and Analysis on application.

MIRFIELD (GAS-COAL) COLLIERY COMPY.
RAVENSTHORPE, NEAR DEWSBURY.

CAST-IRON PIPES

FOR GAS AND WATER.

Pipes, One to Six inch Bore, kept in Stock. Also a very large assortment of all sizes of Bends, T-pieces, and Specials ready for despatch on receipt of Order.

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FOR GAS, WATER, AND STEAM.

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THE SILICA FIRE-BRICK COMPANY,

OUGHTIBRIDGE, near SHEFFIELD,

MANUFACTURE

SILICA BLOCKS, BRICKS, AND CEMENT

OF SUPERIOR QUALITY

FOR GAS-FURNACES.

Trade Mark: "SILICA."

These Goods (largely used in Gas, Glass, Iron, and Steel Works) are, on account of their

GREATER DURABILITY

Strongly recommended where EXCESSIVE HEATS have to be maintained.

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GASEOUS FIRING

FOR LARGE OR SMALL

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PLANS, SPECIFICATIONS, AND ESTIMATES SUBMITTED.

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FOR THE ERECTION OF GAS AND WATER WORKS COMPLETE, AND FOR EXTENSIONS AND RENEWALS.

HOLMSIDE GAS COALS.

(Wrought out of Holmside and South Moor Collieries.)

PRESENT production 4000 tons per working day. Area of coal about 5000 acres, including the largest remaining workable proportion of pure HUTTON SEAM GAS COAL. Analysis of HOLMSIDE GAS COAL *in bulk as shipped* gives 10,500 cubic feet of Gas per ton, of an Illuminating Power of 16¼ candles. The Sulphur is about 1 per cent., and the Ash 1¾ per cent. The Coal cokes well, and leaves about 70 per cent. of excellent Coke. To show the progress of HOLMSIDE COALS, it may be mentioned that the quantity carbonized by the London Gas Companies in 1885 was about 200,000 tons; whereas the present consumption of HOLMSIDE COALS in London alone is at the rate of nearly

600,000 Tons per Annum.

Full particulars on application to

MR. MARK ARCHER,

HOLMSIDE AND SOUTH MOOR OFFICES,

NEWCASTLE-ON-TYNE.

NIDDRIE CANNEL

A FIRST-CLASS CANNEL COAL,

Yielding a large volume of rich Gas, and fully 60 per cent. of first-class Coke.

FOR ANALYSIS, PRICE, AND ALL OTHER PARTICULARS, APPLY TO

The Niddrie & Benhar Coal Co., Ltd.,
15, HANOVER STREET,
EDINBURGH.

Telegrams: "BENHAR, Edinburgh."

Awarded HIGHEST MEDAL and DIPLOMA at the Newcastle-on-Tyne Royal Mining and Industrial Exhibition, 1887, for

CANNEL & COAL.

TYNE

BOGHEAD CANNEL.

Yield of Gas per ton	13,155 cub. ft
Illuminating Power	38·22 candles
Coke per ton	1,301·88 lbs.

EAST PONTOP GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
Coke	70 per cent.

SOUTH PELAW MAIN GAS COAL.

Yield of Gas per ton	10,500 cub.
Illuminating Power	16·3 Candles.
Coke	73·1 per cent.

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THOS. W. DANCE & SONS,
COAL OWNERS, NEWCASTLE-ON-TYNE;
OR
E. FOSTER & CO.,
21, JOHN STREET, ADELPHI, LONDON, W.C.

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REGENERATIVE FURNACES.

Unsurpassed in Efficiency, Economy, Durability, and Easy Working.

NEWBATTLE CANNEL.

Highest Results in Gas, & Excellent Coke.

QUOTATIONS ON APPLICATION TO

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NEWBATTLE COLLIERIES,
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OXIDE OF IRON.

JAMES HUNTER, LESSEE, MINER, AND SHIPPER OF NATURAL IRISH BOG ORE.

This Estate yields the finest and most uniform quality in Ireland; and the quality is guaranteed.

Samples and Prices on application.

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Established 1872.

BOLDON GAS COALS.

Worked by THE HARTON COAL CO., LTD.,
Output about 3000 tons per day.

ANALYSIS—

Yield of Gas per ton	10,500	Cubic Feet.
Illuminating Power	16·9	Candles.
Coke	66·7	Coke.
Sulphur	0·86	Sulphur.
Ash	2·04	Ash.

Boldon Gas Coals are supplied under contract to

The Gaslight and Coke Company, South Metropolitan Gas Company, Commercial Gas Company, Imperial Continental Gas Association, European Gas Company, L'Union des Gaz (the Continental Union Gas Company), Ipswich Gaslight Company, Devonport Gas Company, Newcastle Gas Company, Sunderland Gas Company, South Shields Gas Company, and to many other Companies at Home and Abroad.

For prices, &c., apply to the

HARTON COAL COMPANY,
LIMITED,
Newcastle-on-Tyne.
W. H. PARKINSON,
FITTER.

T.B.KITTEL, SHEFFIELD.

CONTRACTS FOR SUPPLIES OF ANY OF THE PRINCIPAL

ENGLISH & SCOTCH CANNELS.

REAL SILKSTONE GAS COAL

ANALYSIS AND PRICES ON APPLICATION.

T.B.KITTEL, SHEFFIELD.

COKE BREAKERS,

PRICES REDUCED.

(THOMAS & SOMERVILLE'S PATENT.)

New Design, with two Cutting Rollers, making less Breeze than their old pattern.

For Exhauster Advertisement, see last week.

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PARK STREET, SOUTHWARK, E.C.,
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MANUFACTURERS OF

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THORNLEY GAS COALS

WORKED BY THE

WEARDALE IRON AND COAL COMPANY, Ld.

OUT OF THEIR

THORNLEY AND WHEATLEY HILL COLLIERIES.

The Analysis made by Messrs. J. and H. T. Pattinson, Public Analysts for Northumberland, gives 10,500 cubic feet of Gas per ton, with an Illuminating Power of 16·3 Candles and 67·3 per cent. of Coke. The following is a Working Analysis made of these Coals by the Tudhoe and Sunderland Bridge Gas Company:—

[COPY.]

TUDHOE AND SUNDERLAND BRIDGE GAS COMPANY.
Tudhoe Gas-Works,
Spennymoor,
8th June, 1893.

Messrs. The
WEARDALE IRON & COAL COMPANY, LTD.

GENTLEMEN,

For the last two months we have used your **THORNLEY GAS COAL** exclusively at these gas-works; and I have pleasure in herewith giving you the actual results obtained during the trial.

Yield of Gas per ton: 10,300 cubic feet.
Yield of Coke: 13½ cwt.
Illuminating Power of Gas, average of a series of tests, **17 Sperm Candles.**
The Coke was of excellent quality.

The following is a complete ultimate Analysis of the Coal.

	Per Cent.
Carbon	83·128
Hydrogen	5·116
Oxygen	7·401
Nitrogen	0·585
Sulphur	0·620
Ash	3·130
Water	0·020
	100·000

Analysis of the Coke.

Carbon	93·31
Sulphur	0·61
Ash	5·00
Moisture	1·08
	100·00

I am, Gentlemen,
Yours truly,
A. B. COWAN,
Manager.

For Price, &c., apply to the

WEARDALE IRON & COAL Co., Ld.
QUAYSIDE, NEWCASTLE-ON-TYNE.

HEATHCOTE GAS COAL.

RICH IN ILLUMINATING POWER AND YIELD OF GAS.
ABOVE THE AVERAGE IN WEIGHT AND QUALITY OF COKE.
MAINTAINS A HIGH STANDARD IN RESIDUALS.

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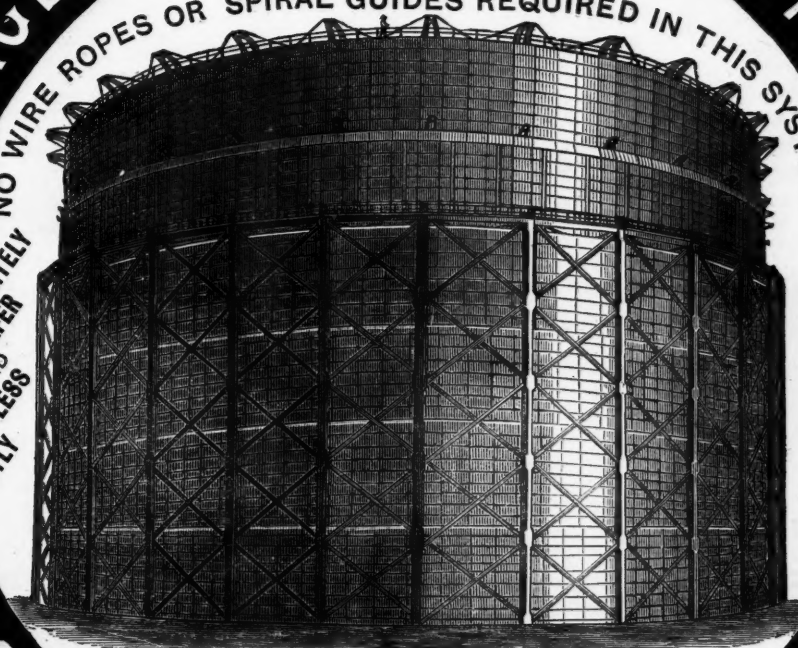
THE LARGEST GASHOLDER IN THE WORLD.

CAPACITY 12 MILLION CUBIC FT.

GASHOLDERS OUR SPECIALITY

NO WIRE ROPES OR SPIRAL GUIDES REQUIRED IN THIS SYSTEM.

INFINITELY SAFER AND FAR LESS COSTLY THAN ROPES OR SPIRAL GUIDES.



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IT HAS SIX LIFTS 30 FT DEEP EACH AND IS 300 FT DIAR

MAKERS OF GAS PLANT OF EVERY DESCRIPTION

ROOFS PURIFIERS &c. ALSO

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GASHOLDERS OF ANY SIZE

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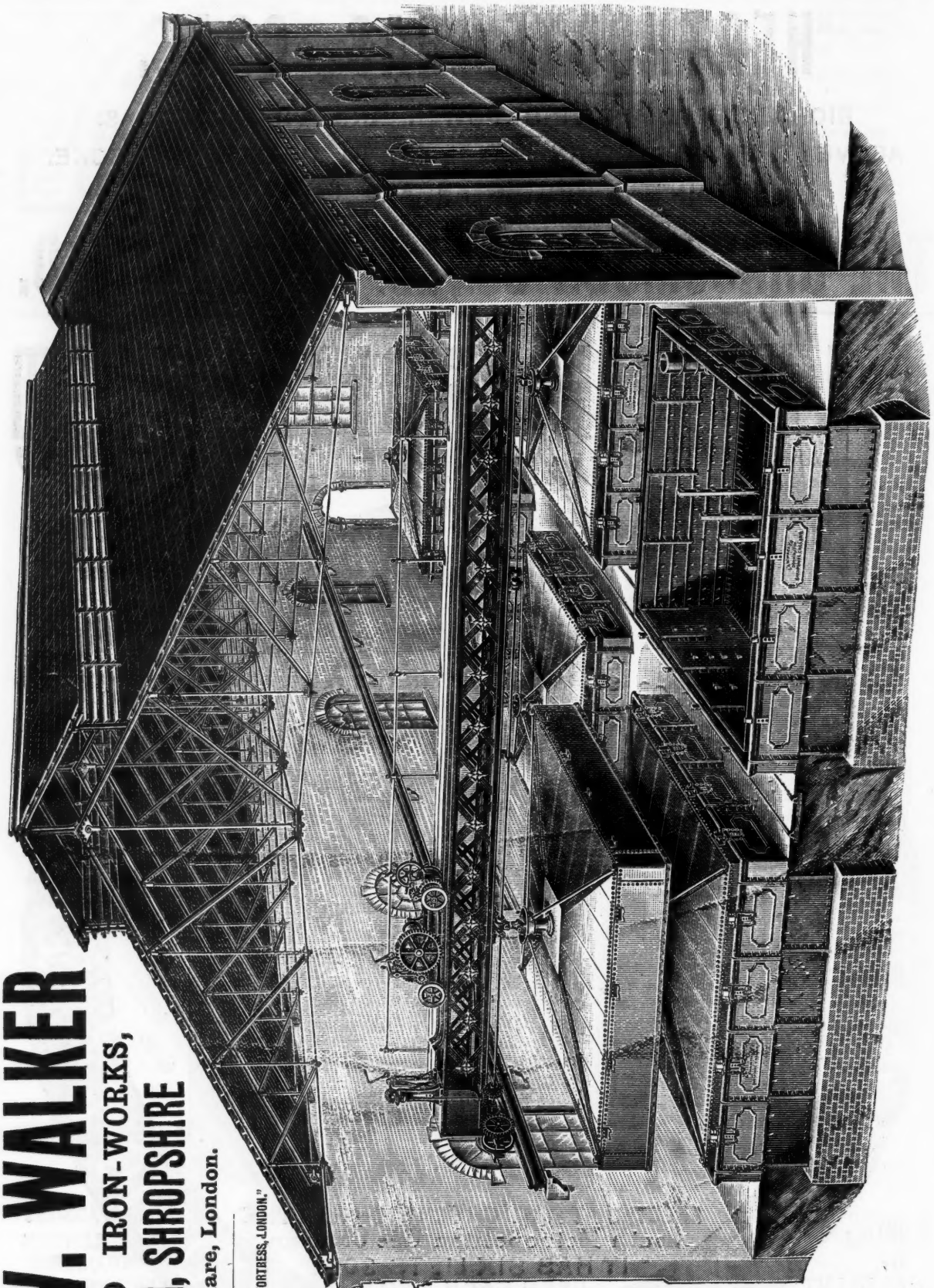
DONNINGTON, SHROPSHIRE

10, Finsbury Square, London.

(TELEGRAPHIC)
"FORTRESS, DONNINGTON, SALOP" "FORTRESS, LONDON."



THE ABOVE ENGRAVING IS A SET OF PURIFIERS AS ERECTED. THEY ARE MADE WITH ALL MODES OF LIFTING APPARATUS—HYDRAULIC OR OTHER POWER—WITH OUR IMPROVED ELEVATORS, AND ARE WORKED WITH ALL DESCRIPTIONS OF VALVES, AND TO SUIT ALL SITUATIONS AND REQUIREMENTS.

CORPORATIONS AND COMPANIES ARE RESPECTFULLY INVITED TO SEND THEIR ENQUIRIES TO US.

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OF WHICH C. & W. WALKER ARE THE AND INVENTORS AND FIRST MAKERS.

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Have confidence in drawing the special attention of GAS ENGINEERS to the following advantages of their Retorts:—
1. Smooth interior, preventing adhesion of Carbon.
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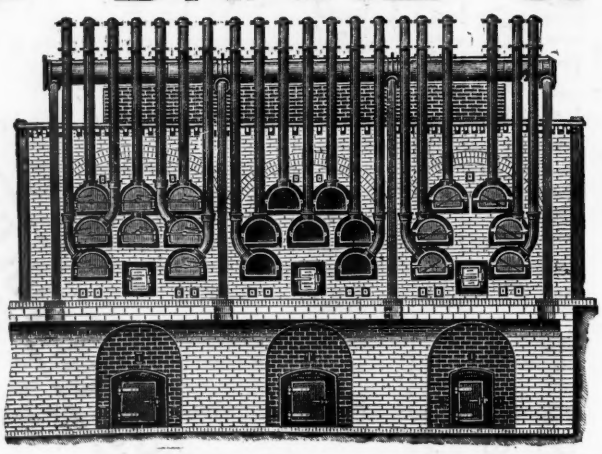

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Makers of every kind of Gas Apparatus and Structural Ironwork.

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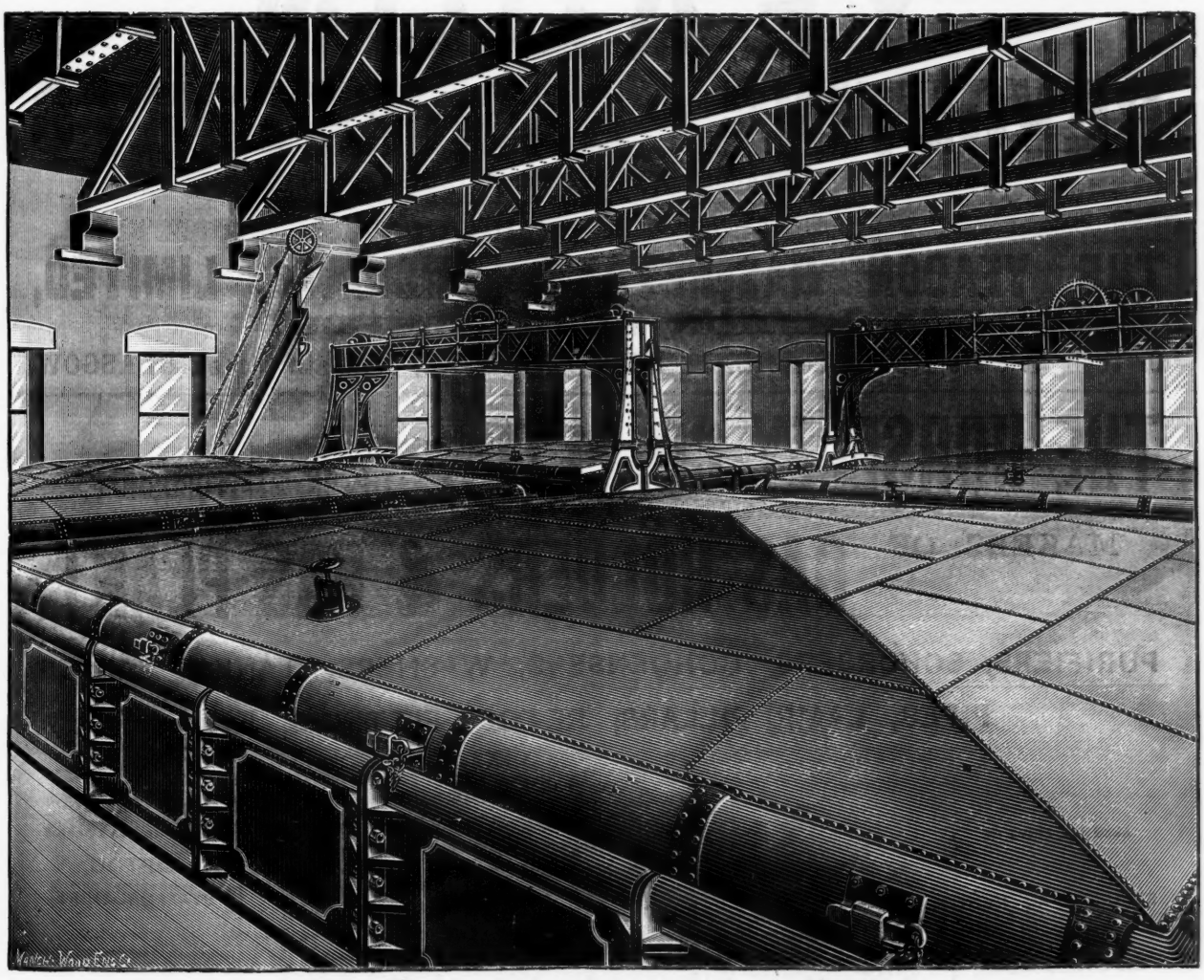

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The Carburettors have been doing practical work for the past two years; in many cases doing all the enrichment without the use of Cannel or other rich Coals. The South Metropolitan Gas Company have these Enrichers at all their Stations. The Gaslight and Coke Company have had them in use at some of their principal Works for two years past; and several more are now being fixed at their other Stations. The Carburettors are also in use at several Suburban and Provincial Gas Companies' Works.

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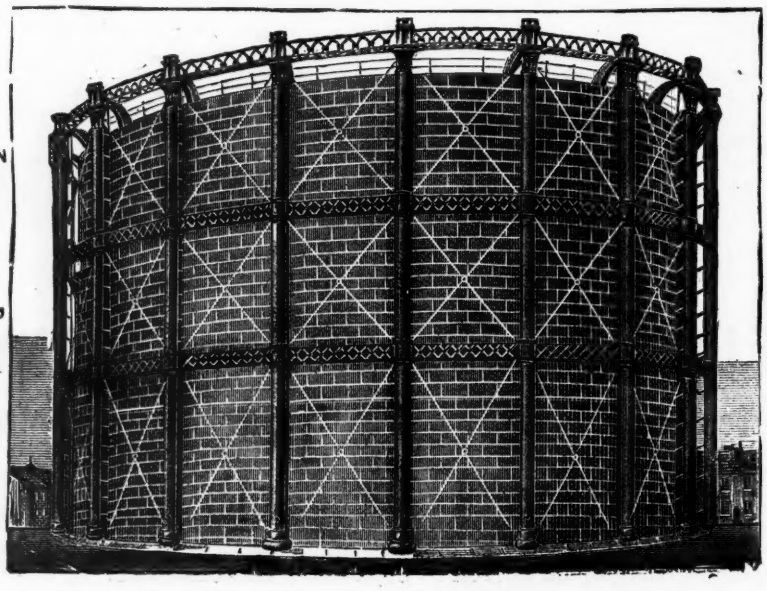

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THE LARGEST SUPPLY OF OXIDE IN HAND OF ANY OTHER FIRM IN THE WORLD.

Purity and Uniformity of Quality Guaranteed.

RIKY AND CO. can supply the above at a much lower rate than any other firm in the trade, being owners of the property where it is found. *No Middleman or Agent* receives a profit.

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Consumption 6 and 9½ cubic feet respectively.

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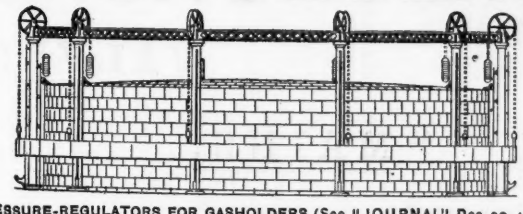

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Supply to any Railway Station, or for Export, all kinds of Fuel for Gas purposes.

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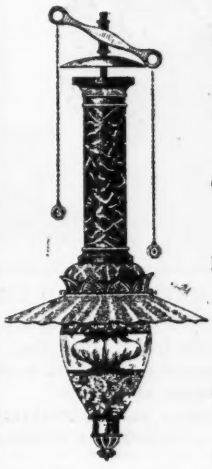

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A 280-CANDLE POWER PLAIN IRON LAMP,

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The Pump of the future for quickly and economically moving large bodies of Water.

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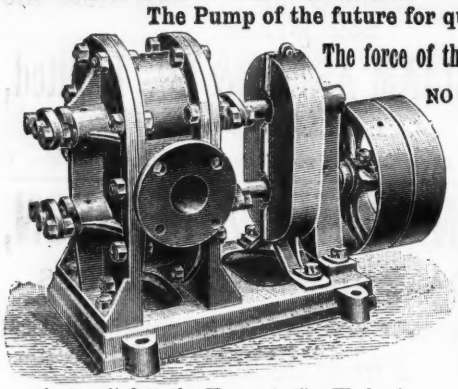

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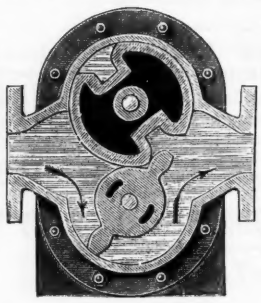

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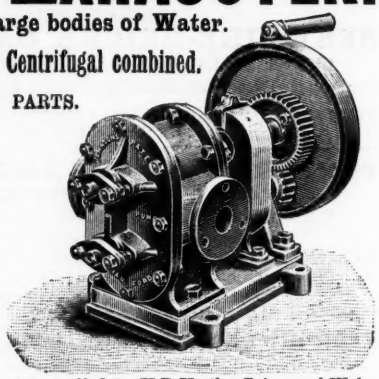

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The most efficient Machine known for extracting Ammonia and other Impurities from Coal Gas is

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The Patent Wooden Balls thoroughly break up the Gas; give an immense amount of freshly-wetted Surface; and do not clog or increase back pressure.

While the Gas is passing through and amongst the Balls, it is continually showered upon by the contents of Buckets.

The Shaft Revolves in Improved Bearings, and all Workings are accessible.

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London: Printed by WALTER KING (at the Office of King, Sell, and Railton, Ltd., 12, Gough Square); and published by him at 11, Bolt Court, Fleet Street, in the City of London,—Tuesday, Nov. 21, 1893.